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THE

SURGEON'S VADE MECUM.

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THE

SURGEON'S VADE MECUM:

A MANUAL

OF

MODERN SURGERY.

BY

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EIGHTH EDITION,

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TO

CHARLES MAYO, ESQ.,

SENIOR SURGEON TO THE HAMPSHIRE COUNTY HOSPITAL AT WINCHESTER

IN ADMIRATION OF HIS SOUND JUDGMENT AND SKILL
IN SURGERY,

AND

IN GRATEFUL ACKNOWLEDGMENT OF EARLY KINDNESS,

THIS WORK

IS DEDICATED BY HIS AFFECTIONATE NEPHEW

AND OBEDIENT SERVANT,

ROBERT DRUITT.

37 Hertford Street, Mayfair, London, W.
1st October, 1859.

PREFACE.

In preparing the Eighth Edition of the present work, I have endeavoured throughout to replace old and doubtful, by new and more certain materials, and so to blend and incorporate the additions, that the bulk of the work shall not be increased. Hence, although nearly thirty new engravings have been added, this edition is not more than thirty-two pages longer than the preceding one.

In the chapter on Inflammation, which is entirely new, I have endeavoured to present the facts in a modern practical guise, stripped of the formal old Hunterian phraseology. Pyæmia and Phlegmasia dolens are removed from the chapter on the Veins, and are treated of in their natural alliance with Erysipelas and diffused Inflammation. Due notice has been taken of the use and abuse of Caustics in the treatment of Cancer. The arrangement of the Chapters on Injuries has been altered, so as to give due prominence to the comparative safety of Subcutaneous Injuries. The whole chapter on Gun-shot Wounds has been written afresh and very much enlarged, from materials kindly placed at my disposal by Mr. George Lawson. The chapter on the Eye has again been most kindly revised by Mr. Haynes Walton, whom I have, besides, to thank for the materials for a section on the Ophthalmoscope. The treatment of Anchylosis by forcible extension; and of Syphilis by fumigation; the recent improvements in Ovariotomy, and in the treatment of Vesico-vaginal fistula; the radical cure of Hernia; and the subject of chloroform and the too frequent deadly results of its administration, may be mentioned as having received special addition or improvement: whilst in the last chapter I have taken pains to bring into small compass the latest and best information on Excision of the Knee-Joint. It will indeed be a reproach to surgeons, if this humane and rational operation shall be discontinued on the plea of want of success or large mortality resulting.

This leads me to speak of *Statistics*, of which, very few notices appear in the following pages, partly from want of space, and partly because much of the statistical information which yet exists is interesting rather than useful, and may even from its imperfection be perverted to unfair purposes. To give the gross mortality after operations is interesting; but that which is required for use, is an enumeration of all cases, so related that they may be classified, and the conditions of mortality made evident: and this work has now been undertaken by Mr. Hutchinson, and other zealous labourers, and in a few years will amount to a really useful body of facts. Meanwhile some conclusions appear which well deserve to be followed up. For instance, when we learn from Mr. Bryant that of Amputations generally 25 per cent. are fatal, 30 per cent. of the lower, 10 per cent. of the upper limbs, and that Pyæmia is the cause of death in 42 per cent. of the fatal cases, and in 10 per cent. of the whole number amputated, we may ask whether this is or is not a preventible cause; and whether the arrangements of hospitals, the sponges, and other substances applied to wounds, the persons by whom they are applied, the mode of dressing, and the details of attendance on the patients, are regulated in accordance with what is known of the causes of the allied disease—puerperal fever—so as if possible to avoid this decimation; or whether it is not looked upon as an inevitable "dispensation of Providence" just as typhoid fever was twenty years ago?

The new wood engravings have been made by Butterworth and Heath from the original drawings of my friend Dr. Westmacott, with the exception of those relating to the Ophthalmoscope and Intussusception, which are the work of Mr. Walmsley.

ROBERT DRUITT.

37 *Hertford Street*, *Mayfair*, *London*, W.
1*st October*, 1859.

CONTENTS.

PART I.

ON SOME AFFECTIONS OF THE NERVOUS SYSTEM WHICH MAY ACCOMPANY LOCAL DISEASE OR INJURY.

CHAP. PAGE

I. Prostration or Collapse 1

II. Delirium Traumaticum 3

III. Tetanus 4
  SECT. 1. Introductory 4
  2. Acute Tetanus 5
  3. Chronic, and Infantile Tetanus . . . 10

IV. Hysteria and Hypochondriasis 11

V. Convulsions 13

PART II.

THE ELEMENTARY PROCESS OF DISEASE AND REPAIR.

I. Malformation, Hypertrophy, Atrophy, and Degenerations of Tissues 15

II. Hyperæmia 18

III. Nervous Pain 19

IV. General Doctrine of Exudation 20

V. General Doctrine of Repair 21

CHAP. PAGE

VI. Inflammation 25
SECT. 1. Introductory 25
2. Analysis of Local Symptoms . . . 25
3. Analysis of Constitutional Symptoms—Traumatic, or Symptomatic Fever, or Feverishness 26
4. Minute Anatomy of an inflamed part . . 29
5. Progress and Terminations . . . 30
6. Causes and Varieties of Inflammation . 31
7. Theory of Inflammation 33
8. Acute Inflammation 34
9. Chronic Inflammation 38
10. Modified Inflammation 40

VII. Effusion of Serum and Œdema 42

VIII. Hæmorrhage 43

IX. Exudation of Fibrine and Adhesion 44

X. Suppuration and Abscess 47
SECT. 1. Suppuration and Analogous Processes . . 47
2. Acute Abscess 50
3. Hectic or Suppurative Fever . . . 52
4. Chronic Abscess and Typhoid Symptoms from Putrefaction of Pus 53

XI. Erysipelas, Diffuse Inflammation of the Cellular Tissue, and Pyæmia 55
SECT. 1. Pathology of Erysipelatous Inflammation . 55
2. The Cutaneous and Cellulo-Cutaneous Erysipelas 57
3. Pyæmia, and the consequences of Septic Liquids introduced into the veins . . 60
4. Phlegmasia Alba Dolens 63

XII. Ulceration 64
SECT. 1. Pathology of Ulceration 64
2. Varieties of Ulcers 66

XIII. Mortification 78
SECT. 1. Pathology of Mortification . . . 78
2. Varieties, Symptoms, and Treatment . . 79

XIV. Scrofula and Tuberculosis 85
SECT. 1. Scrofula and Tuberculosis in general . . 85
2. Particular Scrofulous Diseases . . . 91

CHAP. PAGE
XV. Morbid Growths and Tumours 93
SECT. 1. Tumours generally 93
2. The Fatty Tumour 95
3. The Fibrous, Painful Subcutaneous, Fibro-cellular, Fibro-plastic, Fibrinous, Fibro-nucleated, and Colloid Tumours . . 96
4. Cartilaginous and Osseous Tumours . . 100
5. Glandular and Vascular Tumours . . 102
6. Cystic Tumours 103
7. Epithelioma 105
8. Melanosis 108
9. Cancer 109
10. Elephantiasis Arabum 120
11. General Diagnosis of Tumours from Cancer . 120

PART III.

DIFFERENT KINDS OF INJURIES.

I. Bruises and Subcutaneous Injuries 124
SECT. 1. Introduction 124
2. Bruises and Ecchymosis 125

II. Wounds 127

III. Gun-shot Wounds 132
SECT. 1. General Description 132
2. Lodgment and Extraction of Balls . . 135
3. Collapse from Gun-shot Wounds . . 136
4. Hæmorrhage from Gun-shot Wounds . . 138
5. Gun-shot Injuries of the Head and Face . 139
6. Gun-shot Injuries of the Chest . . 142
7. Gun-shot Injuries of the Abdomen . . 144
8. Gun-shot Injuries of the Limbs—Amputation Primary and Secondary . . . 146

IV. Effects of Heat, Burns, and Scalds 150

V. Effects of Cold 154

VI. Effects of Mineral and Vegetable Irritants . . . 156

VII. Effects of the Poison of Healthy Animals, and Treatment of Poisoned Wounds generally 158
SECT. 1. Effects of Poisonous Insects and Serpents . 158
2. Treatment of Poisoned Wounds . . 160
3. Entozoa 161

CHAP. PAGE
VIII. Poisons contained in Dead Human Bodies, and Dissection Wounds 163

IX. Effects of Poisons generated by Diseased Animals . . 166
Sect. 1. Hydrophobia 166
2. The Glanders 173

X. The Venereal Disease 176
Sect. 1. General History and Pathology . . 176
2. Gonorrhœa 179
3. Primary Syphilitic Ulcers . . . 186
4. Affections that may be mistaken for Chancre 188
5. Treatment of Primary Syphilis . . . 190
6. Bubo 195
7. Secondary Syphilis 197

PART IV.

INJURIES AND SURGICAL DISEASES OF VARIOUS TISSUES, ORGANS, AND REGIONS.

I. Diseases of the Areolar Tissue 203

II. Surgical Diseases of the Skin 203

III. Diseases and Injuries of Muscles, Tendons, and Bursæ . 208

IV. Diseases and Injuries of the Lymphatics . . . 213

V. Diseases and Injuries of the Bones 214
Sect. 1. Diseases depending on Hypertrophy . . 214
2. Diseases depending on Atrophy and Degeneration 216
3. Neuralgia in Bone 219
4. Inflammation and Suppuration of Bone and Periosteum 219
5. Necrosis and Exfoliation 222
6. Caries 224
7. Tumours in Bone 225
8. Fracture generally 227
9. Non-union and False Joint . . . 232
10. Compound Fracture 233
11. Particular Fractures 235

VI. Diseases and Injuries of the Joints 261
Sect. 1. The Synovial Membrane . . . 261
2. The Ligaments 268

CHAP. PAGE
VI. Diseases and Injuries of the Joints—*continued.*
SECT. 3. The Cartilage 268
4. Scrofulous Disease of Joints, White Swelling, and Articular Caries 269
5. Anchylosis 273
6. Disease of the Hip-Joint, or Morbus Coxæ . 275
7. Neuralgia of Joints 279
8. Wounds of Joints 279
9. Dislocation or Luxation generally . . 280
10. Particular Dislocations 281

VII. Injuries and Diseases of the Arteries 298
SECT. 1. Wounds of Arteries 298
2. Secondary Hæmorrhage 304
3. Diffused and Traumatic Aneurysm, and Aneurysmal Varix 306
4. The Hæmorrhagic Diathesis . . . 307
5. Degeneration and Inflammation of Arteries . 308
6. Aneurysm 310
7. Vascular Tumours 318

VIII. Injuries and Diseases of Veins. 323
SECT. 1. Wounds of Veins 323
2. Inflammation of Veins, or Phlebitis . . 324
4. Varicose Veins and Phlebolites . . . 326

IX. Injuries and Diseases of the Nerves 329

X. Injuries of the Head 332
SECT. 1. Wounds of the Scalp 332
2. Concussion of the Brain 333
3. Compression from Extravasated Blood . 336
4. Fracture of the Skull 338
5. Wounds of the Brain, and Hernia Cerebri . 340
6. Traumatic Inflammation of the Brain. . 341
7. Trephining and Paracentesis . . . 344
8. Tumours 345

XI. Diseases and Injuries of the Spine 346
SECT. 1. Diseases and Deformities 346
2. Injuries of the Spine 353

XII. Injuries and Diseases of the Eye 355
SECT. 1. Inflammation of the Eye generally . . 355
2. Injuries 358
3. Diseases of the Eyelids 360
4. Diseases of the Lachrymal Apparatus . 364
5. Diseases of the Conjunctiva . . . 368

CHAP. PAGE
XII. Injuries and Diseases of the Eye—*continued.*
SECT. 6. Diseases of the Cornea 375
7. Diseases of the Sclerotic 379
8. Affections of the Anterior Chamber . . 380
9. Diseases of the Iris 381
10. Inflammation of the Capsule of the Crystalline Lens 386
11. Cataract 386
12. Glaucoma 394
13. The Ophthalmoscope 395
14. Diseases of the Choroid; Asthenopia, Synchysis, and Hydropthalmia . . . 402
15. Retinitis 404
16. Amaurosis 405
17. Short and Long Sight 409
18. Squinting 411
19. Tumours in the Orbit; Cancer of the Eye; Extirpation of the Eye 413

XIII. Diseases and Injuries of the Ear 417
SECT. 1. Examination of the Ear 417
2. Affections of the External Ear . . . 419
3. Affections of the Tympanum and Internal Ear 423

XIV. Diseases and Injuries of the Face and Nose . . . 430
SECT. 1. Affections of the Outer Parts of the Face, Nose, and Lips 430
2. Affections of the Nasal Cavities. . . 439
3. Affections of the Antrum and Jaws . . 443
4. Affections of the Mouth and Tongue . . 453
5. Affections of the Teeth and Gums . . 456

XV. Surgical Diseases and Injuries of the Neck . . . 466
SECT. 1. Surgical Diseases of the Fauces, Tonsils, and Uvula 466
2. Surgical Affections of the Pharynx and Œsophagus 468
3. Surgical Affections of the Larynx and Trachea (including Tracheotomy, and the various circumstances which require it) . 472
4. Surgical Affections of the External Parts of the Neck and Throat 483

XVI. Surgical Diseases and Injuries of the Chest. . . . 490

XVII. Injuries of the Abdomen, and Surgical Operations . 495

CHAP. PAGE
XVIII. Hernia 512
SECT. 1. Nature and Causes of Hernia generally . 512
2. Reducible Hernia 513
3. Irreducible Hernia 515
4. Strangulated Hernia 516
5. Remarks upon the Diagnosis and Complications of Hernia 522
6. Inguinal Hernia 524
7. Femoral or Crural Hernia . . . 534
8. Umbilical, Ventral, and other remaining Species of Hernia 538

XIX. Surgical Diseases and Injuries of the Rectum and Anus . 541

XX. Diseases of the Urinary Organs 555
SECT. 1. Retention of Urine from Spasmodic Stricture 555
2. Permanent Stricture 560
3. Urinary Abscess, Extravasation of Urine, and Fistula in Perinæo . . . 570
4. Some other Affections of the Male Urethra . 572
5. Diseases of the Prostate Gland . . . 574
6. Diseases of the Bladder 579
7. Diagnosis of Blood, Albumen, Pus, and Epithelium in the Urine ; Disease of the Kidneys, Hæmaturia, and Suppression of Urine 583
8. Urinary Deposits or Gravel . . . 589
9. The Various kinds of Stone . . . 593
10. Stone in the Kidney and Ureter . . . 594
11. Stone in the Bladder 595
12. Extraction of Stone by the Male Urethra 596
13. Litholysis, or Solution of Stone . . . 597
14. Lithotrity 598
15. Lithotomy 602
16. Stone in Women 610

XXI. Diseases of the Male Genitals 611
SECT. 1. Diseases of the Penis 611
2. Diseases of the Testis 614
3. Diseases of the Scrotum 621
4. Impotence and Syphilophobia . . . 622

XXII. Surgical Diseases of the Female Genitals . . . 624

XXIII. Diseases of the Breast 631

CHAP. PAGE
XXIV. Diseases of the Hands and Feet, Club Foot, and other Deformities of the Limbs 638

PART V.

THE OPERATIONS OF SURGERY.

I. Operations in general 650

II. Means of Producing Insensibility to Pain . . . 652

III. Minor Operations. 672

IV. Bandaging 680

V. Operations for Tying Arteries 686
SECT. 1. The Carotids, Lingual and Facial . . 686
2. The Innominata, Subclavians, and Arteries of the Arm 690
3. The Aorta, Iliacs, and their Branches. . 700
4. The Femoral and its Branches . . . 705

VI. Amputations 714
SECT. 1. Amputation of the Thigh . . . 714
2. Amputation at the Hip-Joint . . . 720
3. Amputation at the Knee-Joint . . . 721
4. Amputation of the Leg 722
5. Amputation of the Arm 725
6. Amputation at the Shoulder . . . 726
7. Amputation at the Elbow . . . 726
8. Amputation of the Fore-Arm . . . 727
9. Amputation at the Wrist . . . 728
10. Amputations of the Hand . . . 728
11. Amputations of the Foot 732
12. Amputation at the Ankle-Joint . . . 735
13. Affections of Stumps 737

VII. Excision of Bones and Joints 738

APPENDIX OF FORMULÆ 751

INDEX 783

THE

SURGEON'S VADE MECUM.

PART I.

ON SOME AFFECTIONS OF THE NERVOUS SYSTEM WHICH MAY ACCOMPANY LOCAL DISEASE OR INJURY.

CHAPTER I.

PROSTRATION, OR COLLAPSE.

CERTAIN affections of the nervous system may be caused by, or may accompany, or follow, or complicate, various diseases and injuries.

But when we speak of affections of the nervous system, we do not speak of anything immaterial or psychical; for every pain, every disorder of motion, or of thought, depends, without doubt (so far as surgery is concerned), upon physical conditions, although we are not at present able to state what such conditions may be.

DEFINITION.—We shall begin by describing the state commonly known as *prostration*, or *collapse*, or *shock to the nervous system;* by which terms we signify that general depression of the powers and actions of life, which immediately follows any severe injury.

SYMPTOMS.—The usual symptoms are, that the patient lies cold, and half unconscious; with a feeble pulse and imperfect sighing respiration. If the symptoms are analysed, they will be found to be compounded, 1st. Of the effects of depression of the heart's action; including the symptoms commonly known by the term *syncope;* and 2nd. Of the effects of shock, or interruption to the functions of the brain and nervous system; and it will be found that these sets of symptoms are unequally combined in various cases. Thus, sometimes depression of the vascular system predominates, and the patient lies in a state of perfect syncope, with the pulse and respiration imperceptible. Sometimes the nervous system is chiefly affected, the patient being insensible, even though the heart's action is restored; or bewildered and incoherent, as though intoxicated; or even comatose, as though he had taken a narcotic poison. Nausea and vomiting; hiccup; suppression of urine; and in children, convulsions, are also very frequent symptoms.

The *duration* of these symptoms is also extremely various. Sometimes they pass off very quickly; but they may remain even for forty-eight hours before reaction is thoroughly established.

TERMINATIONS.—The process of recovery from collapse is commonly called *reaction;* and if this is healthy and moderate, and especially if the collapse does not arise from injury of any vital organ, and is not attended with the other unfavourable circumstances to be mentioned presently, it will lead to complete recovery.

Secondly. If reaction be imperfectly developed, or if the injury to the nervous system be severe, that state of nervous irritation may follow which is described in the next chapter.

Thirdly. If reaction be altogether wanting, the collapse will terminate in *death* by *syncope* or *asthenia.*

CAUSES.—Collapse may be caused by every variety of injury to which mind or body is liable;—great and sudden extremes of grief, or joy, or fear, or cold;—large doses of any corrosive or sedative poison, such as arsenic, or tobacco;—great loss of blood, and mechanical injuries. It is most important that the surgeon should know what injuries are most likely to be followed by fatal collapse, in order that he may have proper materials for giving his prognosis. They are:—

Injuries of organs that are necessary to life, as the stomach and brain, or that are intimately connected with the visceral system of nerves, as the testicle and eye; and it is well known that severe concussion of these organs may extinguish life instantaneously;—extensive injuries of any sort, especially of the skin and joints;—lacerated and gun-shot wounds; extensive burns;—and injuries that cause very great *pain.* Severe pain, by itself, is capable of exhausting the vital powers.

Lastly. Injuries occurring to the very aged; or to persons that are enfeebled by excess and intemperance, or by long-standing bodily disease, or mental depression; injuries, moreover, which produce a state of blood unfavourable for reparation, or which find the blood in that state. From this it will be learned that the slightest injury or surgical operation may prove fatal to persons who labour under chronic organic disease, especially of the kidneys; or who have been harassed by continued anxiety and despondency of mind; so that in almost any case a firm persuasion that recovery is impossible is almost sufficient to render it so.

TREATMENT.—Supposing a patient to have just received a severe injury, and that independently of hæmorrhage, or of any local injury, he is in such a state of faintness and depression as to render his life precarious, the indication is, to excite the heart and brain to a moderate and healthy reaction. The remedies are, stimulants, of which hot brandy and water (or Formula 27) is the best;—nourishment, such as beef-tea;—and warmth by means of blankets, or of heated bricks, or bottles of hot water put under the axillæ and between the thighs.

When warmth and circulation are restored, the surgeon will hold his hand, so that he may not run the risk of setting up fever, or of bringing on hæmorrhage from any internal organ that may have been injured.—*Vomiting* may be allayed by soda water with brandy, or by sucking ice; or by a full dose of opium (gr. ii.); or by an opiate enema (F. 101), or by a mustard poultice (F. 156) to the epigastrium.—*Hiccup* may be relieved by small doses of sp. ætheris comp.—*Convulsions, delirium*, and *coma*, are to be treated according to the state of the circulation; by ammonia and stimulants whilst it is depressed, but by a very cautious purging, and by application of cold to the head, if they remain *after* the circulation is restored, and the pulse has become firm.

Finally, the vulgar and mischievous habit of bleeding patients immediately after an injury, before they have recovered from a state of faintness and depression, needs only to be mentioned to be condemned.*

CHAPTER II.

DELIRIUM TRAUMATICUM.

DEFINITION.—Disturbance of the brain, of the nature of delirium tremens, following mechanical injuries, especially in persons of middle age and intemperate habits.

SYMPTOMS.—There is usually some anxiety about the region of the heart: the breathing is oppressed and sighing; the pulse exceedingly rapid and bounding, but soft and compressible; the face is flushed, and there may be vomiting. But the principal feature is a peculiar delirium, precisely similar to the *delirium tremens*. The tongue is moist and tremulous; there is a general tremor of the muscles; the skin is covered with perspiration; the patient is totally sleepless, irritable in his temper, answers questions in a snappish, or peevish, or incoherent manner; is often anxious to call himself perfectly well; and, as the malady increases, he becomes restless, impatient, and talkative; wishes perhaps to get out of bed, and attempts to injure his attendants, and soon becomes most furiously maniacal. In some cases, however, the delirium is of a milder cast; the patient is haunted with extravagant ideas and spectral illusions; or fancies himself busied in his ordinary avocations, and talks perpetually about them.

TERMINATIONS.—The *prognosis* will be very unfavourable if the excitement is violent, as that soon leads to coma and death. There will be some hope, however, if the pulse becomes more tranquil and firm, and especially if the patient sleeps.

DIAGNOSIS.—This state of nervous system must not be confounded with the effects of pyæmia, although the distinction may not be always easy. The treatment, however, is much the same.

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* See Travers on Constitutional Irritation, and Hunter on the Blood, chap. ii.

TREATMENT.—The indications are to moderate the excitement, procure sleep, and support the strength.

"If in twelve hours, or earlier, after an injury," says Mr. Vincent, "the pulse does not indicate increased action, if it becomes fluttering and unequal, when the surface does not seem to evolve heat; when the countenance is listless, and the patient reports himself better than it might be expected; and particularly if he is not clear in his answers, then the best of all stimuli, brandy, should be thrown in, and if there be delirium, opium." The opium may be given either in one full dose (such as gr. ii.—iii. of solid opium, or ♏ xl.—lx. of Battley's solution), or in repeated small doses (such as gr. $\frac{1}{4}$—$\frac{1}{2}$, every hour or two hours); the repeated small doses being, perhaps, best, if debility and restlessness are very great. Beef-tea and other mild nourishment should be given, and, if the patient be an habitual drunkard, it will be advisable to allow him to choose his favourite liquor, and not to stint him in it. Mental excitement is better allayed by one or two kind but firm attendants than by straps and strait-waistcoats. The head should be frequently bathed with tepid water, and the bowels be opened by mild aperients. If coma supervenes, counter-irritation by means of sinapisms or blisters to the scalp, feet, or calves of the legs, may be tried.*

CHAPTER III.

TETANUS.

SECTION I.—INTRODUCTORY.

DEFINITION.—Tetanus is a disease manifested by tonic or continuous spasm and rigidity of the muscles of voluntary motion.

DIVISION.—(1.) It is divided into the *idiopathic*, or that which arises from some disorder of the blood or nervous system without wound, and the *traumatic*, or that which is caused by a wound. (2.) It may be *acute* or *chronic*. (3.) It may be *general* or *partial*; and when partial it is mostly confined to the neck and jaws, constituting *trismus*, or locked jaw. (4.) It is called *opisthotonos*, when the body is curved backwards, as it most commonly is; *emprosthotonos*, when it is curved forward; and *pleurosthotonos*, when it is drawn to one side, this being the most uncommon. (5.) The *trismus infantum*, or *neonatorum*, which attacks children soon after birth, is usually made a distinct species. (6.) Tetanus may in its *type* be *intermittent*, when it is caused by marsh miasmata, as it may be occasionally, like almost every other nervous affection. (7.) Lastly, there is the *hysterical tetanus*; in which all the outward symptoms of tetanus are produced, as a consequence of an hysterical state of the system.

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* Copland's Dict. *Art.* Delirium; Graves's Clinical Medicine, 1843, p. 452; Vincent, Observations on Surgical Practice, Lond. 1848, p. 165.

SECTION II.—ACUTE TETANUS.

SYMPTOMS.—The patient first complains of stiffness and pain of the neck and jaws, as from a cold; his voice is husky; it is difficult for him to put out his tongue, and his countenance is observed to have a peculiar expression, resembling a painful smile, because the corners of the mouth and eyes are drawn outwards by incipient spasm of the facial muscles. In the next place, the muscles of mastication and deglutition become fixed and rigid with spasm, so that the mouth is permanently closed, and there is great difficulty of swallowing, especially liquids. To these symptoms succeed a fixed pain at the pit of the stomach shooting to the back, and a convulsive difficulty of breathing, indicating that the diaphragm and muscles of the glottis are affected; and the spasm now extends to the muscles of the trunk and limbs, rendering them completely fixed and rigid. The abdomen feels remarkably hard; there is obstinate constipation, and frequently difficult micturition from spasm of the perinæal muscles; the pupils are contracted; and the saliva flows from the mouth, because the patient is unable to swallow it. This spasm never ceases entirely; but it occasionally has a lull, and then comes on again in fits of greater violence. Such fits are easily brought on by any disturbance, such as an attempt to swallow, or by any other bodily movement or mental excitement, and most remarkably by slight causes affecting the surface of the skin; such as currents of cold air. There are generally some snatches of relaxation during sleep. Meanwhile the intellect is undisturbed, and the pulse may be natural, except during a severe paroxysm, which quickens it, and causes perspiration and thirst.

TERMINATIONS.—(1.) If the case is about to end *fatally*, the paroxysms become more frequent and violent, and the breathing more and more embarrassed by spasm of the diaphragm and of the muscles of the glottis; and at last the patient dies, either from exhaustion or from suffocation;—either because the nervous system is worn out by the violence of the spasm; or because the respiration is suspended long enough to cut off the necessary supply of arterial blood from the brain, and so to induce insensibility. The most usual *period of death* is the third or fourth day; sometimes it is postponed till the eighth or tenth, but rarely later. On the other hand, there is the case * recorded of a negro who injured his hand, and died of tetanus in a quarter of an hour; and cases of death within twenty-four hours are by no means uncommon. (2.) When acute tetanus terminates favourably, still the patient's recovery may not be complete for weeks or months;—partly because of the strainings and lacerations which the muscles have suffered,—partly because of the remaining tendency to spasm, which very slowly yields and is apt to be temporarily aggravated by very slight causes, especially cold and damp. But in some rare instances the disease has been removed almost instantaneously by the removal of its exciting cause.

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* Rees's Encyclopædia, *Art.* Tetanus.

PROGNOSIS.—The prognosis in acute tetanus is extremely unfavourable, especially if traumatic; it is more favourable in the idiopathic, and the chronic generally gets well of itself. Death very seldom occurs after the twelfth day. As a general rule, it may be said that the prognosis is *favourable* if the complaint is partial;—if it does not affect the muscles of the glottis;—if it has lasted some days without increasing materially in severity;—if it is sensibly mitigated by the remedies employed;—if the pulse is not much accelerated;—if the patient sleeps;—and if he has been subject to it before in an intermittent form. On the other hand, the prospect will be *unfavourable*, if the spasms continually increase in severity, and especially if they affect the muscles of the glottis.

DIAGNOSIS.—Tetanus may be distinguished from *hydrophobia* by the spasms being *continuous*, and by the patient being in general sensible, and calm to the last;—whereas in hydrophobia, there are fits of general convulsions with *perfect intermissions*, and the patient is mostly delirious. *Inflammation of the spinal cord*, or of its membranes, may be distinguished by the pain in the back and fever, and by the paraplegia and coma which supervene in most cases.

MORBID ANATOMY.—The morbid appearances that have been found in different cases are as follow:—Increased vascularity of the membranes and substance of the *spinal cord*, with or without effusion of serum;—more rarely the same appearances may be found in the cranium;—flakes of cartilage and spicula of bone deposited in the membranes of the spinal cord;—vascularity of the nerves leading from the wounded part;—of the mucous membrane of the stomach; and of the sympathetic ganglia;—and congestion of the lungs. But there is not one of these morbid changes that is constantly, and except the first, there is not one of them that is even frequently, found. The muscles are extremely rigid after death, and ecchymosed or ruptured in many parts;—the blood is mostly uncoagulated.

CAUSES.—Tetanus may be caused by wounds and external injuries of every description, but especially by lacerated and punctured wounds of the hands and feet, gun-shot wounds, compound fractures, compound dislocation of the thumb, and wounds irritated by foreign matters, or in which nerves are exposed. Mr. Morgan knew it even caused by a blow with a schoolmaster's ferule; but it is very rarely caused by clean simple incisions. The period at which it may come on after an injury is very uncertain. Sometimes it occurs very quickly, if the patient is predisposed to it. Sometimes it seems to be induced by the great pain and irritation of a wound during its inflammatory state: but the most common period is, when the wound is nearly healed.

It is probable, however, that in most instances some concurrent or predisposing cause, in addition to an external injury, is required to produce tetanus. Of such causes, the best established are, 1st, an irritated state of the gastro-intestinal mucous membrane;[*] and, 2ndly, exposure to cold damp night air during warm weather, or in a warm climate; consequently, tetanus is much more prevalent and fatal in warm than in cold or temperate climates.

The same causes, cold and visceral irritation, namely, which predispose to the traumatic, may of themselves produce the idiopathic tetanus. Thus the latter may be a consequence of various visceral irritations, especially of the womb. Whytt gives the case of a girl, aged twenty, who caught cold during the menstrual period, and died of tetanus in eighteen hours; and the author knows a case in which fatal trismus followed uterine irritation, consequent on abortion.[†]

Tetanus may also be caused by certain poisons, especially the nux vomica.

PATHOLOGY.—The spasms of tetanus affecting as they do all the voluntary muscles, must evidently depend on some morbid condition of that central organ, the spinal cord and medulla oblongata, from which all the voluntary muscles are supplied with nerves. What that condition is, is unknown. It may be dependent on a peculiar state of blood, inasmuch as we know that when blood containing strychnine circulates through the nervous centres, it causes tetanic symptoms. Or it may depend on some disturbance in nervous action, independently of the blood, of which we are profoundly ignorant. Such nervous disturbance may be *centric*, that is, may depend on causes affecting the spinal marrow itself; or *excentric*, that is to say, may depend on irritation of some other part of the body, which irritation is conveyed to the spinal cord by the *sentient* or *afferent*, or, in Dr. Hall's language, *excito-motor* nerves.

It is quite certain that the morbid condition cannot be regarded as inflammatory in the ordinary sense of the word, because the spinal cord is often found after death without a trace of vascularity, and because tetanus may be established during a state of depression and collapse that would be quite incompatible with inflammation.

Although, however, it is most certain that inflammation is not essential to the existence of tetanus, still it is equally certain that there is one class of tetanic cases which presents a well-marked inflammatory character. They commence with shivering and pain, are attended with fever, and, if fatal, display on inspection, congestion, serous effusion, softening or purulent deposit, in some part of the brain or spinal cord.[‡] But this class is a small one.

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[*] For cases arising from intestinal irritation, vide Med. Gaz. vol. i. p. 646; Med. Chir. Trans. vol. vii. p. 459; Ibid. vol. vii. p. 474, et seq.; Abernethy, Lectures on Surgery, London, 1835, p. 23; Travers, Further Inquiry concerning Constitutional Irritation, London, 1835, p. 397; Fournier-Pescay, Dic. de Sc. Med. Paris, 1821, vol. lv. p. 9; Wincelslai Trnka de Krzowitz, Commentarius de Tetano *Vindobonæ*, 1777; Dictionnaire de Médecine et Chirurgie Pratiques, Paris, 1836, *Art.* Tetanos; B. Gooch, Chirurgical works, Lond. 1792, vol. ii.

[†] See Cooke's Morgagni, vol. i. p. 129; and the Lancet for June 2nd, 1838.

[‡] For cases of inflammatory tetanus, vide Med. Gaz. vol. i. p. 645; Fournier-Pescay, op. cit.; Burmester in Med. Chir. Trans. vol. ii.

Treatment.—The indications are, 1st, To remove, so far as we are able, all conditions, known or believed to have the power of creating the tetanic state; and, 2nd, To give the patient every chance of spontaneous recovery, by husbanding his strength till the disease shall cease of itself.

In the *local treatment*, the first points to be accomplished are, to remove all extraneous bodies from the wound, if there be one; to make incisions, if necessary, for the free discharge of pus, or for the relief of inflammatory swelling and tension; and if any isolated portion of nerve or tendon happens to be on the stretch, to divide it. Then the part may be fomented with warm decoction of poppies; after which, warm opiate or belladonna lotion may be applied on lint, and the whole part be enveloped in large soft poultices. Sundry other measures have been proposed in order more effectually to remove local irritation; such as the division of the principal nerve leading from the wound; or, as Mr. Liston has proposed, the making a ∧ incision above, so as to isolate it and cut off as much nervous communication as possible; or the destruction of a ragged, contused, ill-conditioned wound by *actual cautery*, as Larrey and others have practised with great benefit: or the *excision of the wound* if cicatrized or nearly so. Sometimes, when the wound is nearly cicatrized, or has ceased to suppurate, the application of a blister or of strong stimulating ointments has been of service; but, as Mr. Curling* observes, it happens, unfortunately, that the tetanic condition of the spinal cord, when fully established, is mostly independent of its local exciting cause, and does not cease on its removal. Hence *amputation* of the injured part has very rarely been successful, and has even aggravated the mischief; so that as a general rule it ought not to be performed, unless desirable for some other reason besides the tetanus.

We must next review the *constitutional remedies* that have been employed in tetanus, stating their relative utility, and the cases in which they are most likely to be beneficial.

1. *Antiphlogistic measures.*—Bleeding cannot be used unless there is satisfactory evidence that the disease is dependent on, or accompanied by, inflammation of the spinal cord.

Mercury, given so as to induce ptyalism, was thought to do good in tetanus thirty years ago, when it was called the *sheet anchor*, and believed to do good in all cases. But there is no satisfactory evidence that it is of use. *Purgatives* are indicated, because a loaded state of bowels is known to be a cause of very morbid conditions of the nervous system, and because, possibly, they may eliminate some unnatural element in the blood. Thus, a powder of calomel and jalap mixed with butter may be put at the back of the tongue, for the patient to swallow, and may be followed in an hour with a large dose of castor oil, or by a drop or two of croton oil; and enemata of turpentine may be administered until the bowels are completely unloaded.

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* A Treatise on Tetanus, being the Jacksonian Prize Essay for 1834, by T. Blizard Curling, London, 1836, p. 122.

2. *Sedatives.*—Tobacco once had the credit of being an efficacious remedy; but it is so fatal a poison, and chloroform so much more likely to do good, that we cannot advise the surgeon to resort to it.

Cold is of eminent service to animals affected with tetanus; and a soldier was once most unexpectedly cured by exposure all night in severe weather. It may therefore do good to apply cold extensively to the spine by means of bladders, or ox-gullets filled with ice, or with various frigorific mixtures; taking care to support the circulation by internal stimulants.[*] But the cold bath, and cold affusion, although they are of great service in chronic tetanus, are most hazardous in the acute, and have more than once proved instantly fatal.

3. *Narcotics.*—Opium is of most undoubted efficacy in some instances, probably those attended with a painful wound, and weakness. When it produces good effects, they are soon manifest. It may be given in large doses, in the form of enema or suppository.

4. *Chloroform.*—This is the most promising remedy, and in several cases has been of real service; in others, on the contrary, either the remedy has soon lost its power of mitigating the spasms; or else, although the spasms have been subdued, the patient has died, either from exhaustion, or from some inscrutable alteration in the nervous centres.[†]

The *Indian Hemp* has been employed with very good effects, by Dr. O'Shaughnessy and others at Calcutta, and by several practitioners in this country (F. 29).

5. *Stimulants and Tonics.*—The preparations of iron and bark have been useful in cases attended with marked debility. Several cases are on record in which recovery followed the use of ardent spirits in very large quantities.[‡]

6. It is very important to protect the patient from all irritation and disturbance. He should be kept quiet and in the dark; and the administration of remedies should be managed so as to cause as little annoyance as possible. The evacuation of the bowels should be effected thoroughly once for all; and the patient be cautioned against speaking, moving, or swallowing oftener than he can help.

Lastly, in a disorder the nature of which is yet so obscure, the conscientious surgeon will take care to do no harm, if he can do no good. The most positive and hopeful plan, in idiopathic cases, is the thorough evacuation of the bowels. This should also be attended to in traumatic cases; taking care in both not to use too violent remedies. Then chloroform inhalation, or cold to the spine, or morphia, or belladonna in cautious doses, should be tried in order to mitigate the spasms; and in every case the inevitable tendency to exhaustion should be kept in view, and be combated by food, by fermented liquors, and by quinine and other tonics. When there is much difficulty of swallowing, both nourishment and medicine must be administered by enema, or by passing a tube through the nose down the œsophagus.*

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[*] See some observations by Dr. Todd, quoted in Ranking, x. 33.

[†] See two cases by Dr. Cotton of Lynn, Prov. Med. Journ. May 15, 1850; fatal, though sufferings relieved by ether and chloroform inhaled; case by Mr. Sloman of Farnham, quoted in Ranking's Abstract, x. 36; chloroform soon lost influence; patient recovered under calomel and morphine.

[‡] See two cases in the Lancet for 1845, vol. I.

SECTION III.—CHRONIC AND INFANTILE TETANUS.

CHRONIC TETANUS is very seldom fatal, although in some rare instances the patient has died completely exhausted by its long continuance; for it sometimes lasts several weeks. The principal remedies are aperients, tonics, chloroform, and the shower-bath. The bowels should be kept freely open, but not by too drastic medicines. Electricity, in the form of sparks, or weak shocks down the spine, would probably be of service.†

TRISMUS INFANTUM is a form of tetanus which is almost unknown in England. It was formerly, however, exceedingly prevalent in Ireland, and appears to be met with there occasionally, even at present. It carries off a vast number of children in the West India Islands; and we learn from Dr. Holland, that in the desolate rocky Vestmann islands, on the south coast of Iceland, one hundred and eighty-six infants perished of it in twenty-five years, although the population does not exceed one hundred and fifty souls. The causes appear to be, want of ventilation, and filth, or the innutritious and unwholesome diet of the parents, such as the fish and sea-bird eggs that form the only sustenance of the Vestmann islanders; and the use of irritating applications to the wound left by the falling off of the navel-string. The time at which the disease appears is generally from the fifth to the tenth day after birth; hence the popular Irish term, *nine-day fits.*

The *symptoms* are, locked-jaw, spasmodic difficulty of breathing and swallowing, and general convulsions. They are almost invariably attended with diarrhœa, and preceded by fretfulness, startings during sleep, and unusual greediness for the breast.

Treatment of any kind is seldom successful; but it may be presumed that the warm bath, four or five doses of calomel (gr. i.—ii.) at intervals of four or five hours, a teaspoonful or two of castor oil to clear the bowels, and minute doses of laudanum (one-eighth of a minim, cautiously increased) every two hours afterwards, or chloroform, are the measures most likely to be of service.‡

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* For an account of the proposal to cure tetanus by inoculation with the Woorali poison, see Waterton's Wanderings; Brodie's Papers in the Phil. Trans. for 1811, p. 178, and 1812, p. 205; and Morgan's Lecture on Tetanus.

† Addison on Electricity in Convulsive Diseases, Guy's Hosp. Rep. vol. ii.

‡ See a paper by Joseph Clarke, M.D., in Med. Facts and Obs. vol. iii. Lond. 1792; Sir H. Holland's Med. Notes and Reflections, 2nd Ed. p. 29; Maunsell and Evanson on Diseases of Children, 4th Ed. Dublin, 1842, p. 219; and Maxwell on Yaws and Tetanus, Edin. 1839.

CHAPTER IV.

HYSTERIA AND HYPOCHONDRIASIS.

I. HYSTERIA is a profound disturbance of the nervous system, most usually affecting women, but not unknown in men. Our limits prevent us from treating of it further than as it is an occasional complication of surgical disease; suffice it to say that it seems to consist in an exaggeration or disturbance of the emotions of the mind, and in the sensitive and motor powers of the body; and that it may ensue upon disturbance of health of any kind, mental suffering, delay in the development of the generative organs, or some chronic form of mal-assimilation, such as a latent gouty or rheumatic taint. It is remarkable for the great diversity of symptoms it may cause, and of the diseases it may simulate. Mental disturbance of all kinds, from the most vivid delirium to the most profound torpor; muscular affections ranging between utter palsy and frightful spasm; disturbance of sensation, including the most violent pains and the most perfect numbness; irregularity of the circulation, of the digestion, and of every other function are among its effects.

As an illustration we may refer to HYSTERICAL TETANUS. A female may be seized with stiffness of the muscles of the face and jaws, which may extend to the neck, and gradually invade the trunk and limbs, so as completely to close the mouth, and render the whole body rigid and motionless. The chief points of diagnosis are, the hysterical state of the mind; and the fact that the muscular contraction, however great, may almost always be overcome for the moment by forcing the patient to exert her volition. The best remedies are gentle aperients, valerian, and other antispasmodics, and henbane.

HYSTERICAL NEURALGIA.—Hysteria is apt to cause fits of pain, which simulate various acute or chronic diseases. Sometimes it is violent pain in the head, with stupor; sometimes pain in one side, in the seat of pleurisy; sometimes pain and tenderness of the abdomen. Now although the patient may describe the sensations of pleurisy or peritonitis, and very likely may feel them, yet positive physical signs are absent, and many symptoms may be elicited by art which are quite incompatible with the existence of serious organic disease. Thus the patient with hysterically simulated laryngitis, though breathing fast and noisily, if she speak, may speak without hoarseness, and will not display in the face the signs of approaching asphyxia. An hysterical patient with pleurisy will expand the ribs freely; and in hysterical peritonitis, as in other hysterical diseases, the patient flinches from a slight touch, and yet, if her attention be engaged, will bear firm pressure without complaint.

In the same manner, any one of the limbs or joints may be affected with pain, tenderness, and spasm, as if one of the joints were diseased; or there may be pain in the spine, with great sensitiveness of some particular vertebra, tympanites of the belly, and difficulty of making water, or irritation along the nerves corresponding to the vertebra affected; a condition known as *spinal irritation.*

As we are not writing a treatise on Hysteria, but merely giving some hints on the possible difficulty of diagnosis arising from its presence, we will only remark, in addition to the exaggeration of the sensational symptoms, and the absence of physical signs, that the practitioner should notice the hysterical physiognomy, and consider whether the duration of the symptoms accords with that of known diseases.

There are two mental conditions generally found in hysteria, although they are not peculiar to it, but belong rather to *invalidism* in general. One is a tendency to imitation, in which the patient believes that he or she is afflicted with any disease whatever which may strike his imagination or which he chances to hear of, or which is the subject of general conversation. The other is a diseased egotism, which makes the patient delight in being ill, so as it secures the undivided attention and sympathy of those about her. This is at the bottom of those marvellous and otherwise unaccountable tricks which hysteric patients resort to in feigning disease.

TREATMENT.—Our limits do not allow us to do more than glance at this part of a very large subject; but we may observe—

1st. That there are no drugs which are specifics for hysteria, but that every case must be treated on its own merits. The state of the digestive organs, of the colon, of the urine, and uterine function; of the blood, whether impoverished or not; and of the mind, must all be regarded. Aperients, good diet, and, above all, change of residence, and warm aromatic medicines, especially valerian, are the measures most likely to do good.

2ndly. That all *heroic* measures, leeches, blisters, issues, setons, examinations with the speculum, and other things justifiable in cases of true organic disease, do infinite harm in hysteria.

3rdly. That warm soothing liniments, as F. 148, &c., are the best local applications.

We will conclude with three rules, which we entreat the young practitioner to observe, assuring him, from ample experience, that they will save him much trouble.

1st. Be sure that you do not treat hysterical sensations as organic disease. If you do, you lead the patient into endless debility and trouble; especially if it is the womb which is believed to be diseased.

2ndly. Never treat an organic disease as if merely hysteric. If so, you may lose your character and the patient's life or limb.

3rdly. Remember, that organic disease may exist, and hysteria too; and that the presence of hysteria is no proof that the whole case is hysteric. Therefore, in any case of local pain, long continued, if the health and flesh fail, suspect that there may be some organic cause, though the bulk of the symptoms be hysteric. To order sea-bathing and horse-exercise for an hysterical girl with pain in the back, and to discover vetebral caries afterwards, is not good.

II. HYPOCHONDRIASIS is a low, desponding state of mind, generally accompanied by a vitiated state of blood and imperfect excretion, or by some cause of exhaustion. The patient is apt to imagine himself the prey of a variety of diseases. By way of example we may refer to Syphilophobia.

A patient consults the surgeon, assuring him that he is labouring under a severe and confirmed secondary syphilis. On being questioned, it may be found that there is no satisfactory evidence that he has had primary syphilis; and he will point to a small pimple as his secondary symptoms. He ascribes every sensation, however innocent, to the working of the poison in his veins, and cannot be convinced to the contrary.

The three rules we have laid down regarding hysteria are here of immense utility. A patient may be fanciful, yet his maladies may not be *all* fanciful, and the surgeon who overlooks this possibility is guilty of carelessness and cruelty. One more rule we must lay down with respect to confirmed hypochondriacs—*Never attempt to argue them out of their belief.* If the diseased sensations could be argued away, the patient need not have come to you. Treat the case on the principle, that the patient's sensations and mental powers are disordered by serious aberration in the bodily health, or by some mental trouble; it may be grief, or low living, or exhausting fatigue, or a gouty taint. Do not ridicule or ignore the patient's statement. Many an inexplicable sensation, put down to *nervousness*, has been the forerunner of organic disease. Therefore, examine the local symptoms carefully, and if you find no local disease, treat the general health on common principles.

CHAPTER V.

CONVULSIONS.

IN order to complete the view of nervous disorders produced by local injury or disease, it is necessary briefly to allude to *convulsions*, occurring in epileptiform paroxysms. These are familiar in *medical* practice, when arising from irritation of the gums, of the stomach, of the uterus, &c.; they also occur occasionally from some of the local affections which custom has assigned to the surgeon. In particular, they may arise from spicula of bone growing from the inner surface of the skull; or from slight injuries to the skull which have left the bone unsound; and especially from irritation of the urinary organs; retention of urine, renal calculus, and the like. In children, convulsions are apt to be produced by severe injuries or diseases of any kind, at the time when the nervous system is beginning to be exhausted.

The *symptoms* it is not necessary to describe in this place. As to the *treatment*, the following are the main indications: 1. To search for, and remove, or soothe any external source of irritation. 2. To evacuate disordered secretions. 3. To lessen accumulation of blood in the central organs of the nervous system, if it exists, as indicated by firm pulse, and turgid lips, eyes, and countenance. Ice to the head, and mustard to the feet, are almost equivalent to a cupping. 4. In the opposite class of cases, with feeble pulse, pale face, and dilated pupil, to give beef-tea and brandy. 5. In all cases to give sufficient nourishment.

PART II.

ELEMENTARY PROCESSES OF DISEASE AND REPAIR.

CHAPTER I.

MALFORMATION, HYPERTROPHY, ATROPHY, AND DEGENERATION OF TISSUES.

I. Congenital Malformation.—In the present part of our work we propose to give a general view of the various changes of form or of structure which may be met with in any part of the body, from any cause interfering with the regular processes of nutrition and function. Amongst these, the earliest in point of time, are the various original malformations, which occur through some inexplicable defect in the vital powers of the germ out of which the fœtus is developed. Of such malformations, some depend on an *arrest of development*, through which various organs, or parts of organs, are left, as it were, incomplete and unfinished. Such are the cases, which come under the surgeon's notice, of *spina bifida*, or incomplete closure of the arches of the vertebræ; such are *hare-lip* and *cleft-palate*, which arise from a similar condition of the bones and soft parts of the face;—such, too, are *epispadias*, and *hypospadias*, or incomplete closure of the receptacle and ducts provided for the urine. From a like want of development, though the immediate effect is opposite, arise the conditions of *imperforate anus*, or *vagina*.

Other cases of congenital deformity are caused by local *excess of development*; such as, for instance, supernumerary toes and fingers. Others, again, arise from defects in the original constitution of the ova; so that one fœtus becomes adherent to another; or even becomes included within the body of another.

Of the causes and prevention of congenital deformities, it is not worth while to speak. Of the treatment of such as are capable of relief by surgical means, mention will be made in Part IV., in the chapter devoted to the organ in which each variety may occur.

II. Intra-uterine Disease.—Children are sometimes born with deformities which ought to be distinguished from those mentioned in the preceding paragraph, insomuch as they do not result from any defect in the germinal power of development, but from diseases occurring to the fœtus, which produce within the womb the same effects that they would produce at any other period of life. Such are the congenital club-foot, and dislocation of the hip; and those very curious instances of spontaneous amputation, so called, in which one of the limbs of the fœtus becomes tightly entangled in a loop of the navel-string, or in an accidental band of lymph, and is strangulated and cut off in consequence.

III. HYPERTROPHY.—This term signifies not merely an increase of bulk, or swelling of an organ, but an increase in size, depending on an increase in its healthy structure. Genuine hypertrophy, too, is usually attended with increased *development:* that is, with the unfolding of a higher order of structure, so that the hypertrophied organ acquires new and greater powers. It is, generally speaking, a healthy and conservative process, whereby the hypertrophied organ is enabled to do more than its ordinary share of duty, and to compensate for some deficiency in some other part of the economy.

"The *causes* are," as Mr. Paget observes, "chiefly these three. 1. The increased exercise of a part in its natural functions; 2. An increased supply of healthy blood; 3. An increased accumulation in the blood of the particular materials which any part appropriates in its nutrition, or in secretion."

(1.) Instances of hypertrophy from the first cause specified are afforded by the bladder, which, in cases of obstruction to the passage of urine, becomes greatly more capacious, with its mucous and muscular coats developed into a state of greater power, fitting them for the increased pressure they are obliged to bear and to exert;—by the cuticle. thickened into corns by pressure and friction; and by the bursæ developed, under like conditions, in the cellular tissue.

(2.) Instances of hypertrophy from increased supply of healthy blood are afforded by the growths of hair which sometimes take place in the skin in the neighbourhood of ulcers; and by the elongation of one of the bones of a limb of a growing child, which sometimes occurs when a vascular ulcer of the skin, or disease of an adjoining portion of bone, has for a considerable time caused an unusually copious current of blood to circulate in the vicinity.

(3.) Hypertrophy caused by a particular condition of the blood is exemplified in the increase of one kidney, which occurs when the other is incompetent, through disease or injury, to abstract its share of urinary matter from the blood. The ossifications which take place in the legs of certain breeds of horses are owing probably to the same cause, so perhaps is goître; the obesity of great eaters certainly is.

(4.) Lastly, hypertrophy arises occasionally from some derangement, perhaps purely local, of the power of growth or development, whereby a portion of a bone, or of the fatty tissue, will grow disproportionately to the rest of the body, and form a tumour.

The *treatment* of hypertrophy must consist in removing the causes, if possible.

IV. ATROPHY is the reverse of hypertrophy; it is the wasting of an organ in size.

V. DEGENERATION.—This may be defined to be the loss of the proper structural characteristics of an organ; or the substitution of a lower for a higher form of tissue; so that degeneration differs from pure atrophy, although some amount of it is usually superadded.

The chief forms of degeneration are—1st. The *obese*, in which there is a development of fatty tissue, occupying the place of muscle, or some other higher tissue. This is often seen in the heart.

2ndly. The *fibrous*, in which fibrous tissue, often imperfect or *fibroid*, is substituted.

3rdly. The *fatty*, or *oily*, which does not consist in development of fatty *tissue*: but in decay of the proper substance and structural characters of an organ, and its conversion into a mass of granules, mixed with oil globules and crystals of cholesterine.

4thly. The *earthy*, or calcareous, in which there is an infiltration with earthy matter, consisting of carbonate and phosphate of lime, with traces of magnesia.

The fatty degeneration is liable to affect the muscles, and particularly the heart; it may occur in the cornea of the aged, the lungs of the emphysematous, the kidneys of those who die of Bright's disease, and in every variety of cell growth and tumour. It has no connexion with general obesity; for examples of fatty degeneration of single organs may be found in bodies which otherwise are extremely emaciated.

The *causes* of atrophy and degeneration are—1st. Disuse, or want of exercise, which is sure to cause any organ, be it brain or muscle, to waste.

2ndly. Diminished supply of blood may in some cases cause atrophy, as in others it causes ulceration or gangrene; but an organ whose vitality is active is almost sure to attract blood enough to itself, if there is no utter physical obstacle to the current.

3rdly. Deficiency in the blood of the materials necessary for healthy growth and nutrition of an organ is a third cause. This may be exemplified by the atrophy of bone and muscle when there is an insufficient supply of food, or when the materials necessary for them are wasted by undue secretion.

4thly. Deficient vitality; deficiency of that power by which every organ is enabled to maintain its growth, and to abstract from the blood the materials for its nutrition. This again may be caused by exhaustion;—by excessive fatigue;—by over use or abuse of a part;—by disease (especially by inflammation), which has spoiled its tissue; and by injuries to the nervous centres or trunks supplying it.

Lastly. It is believed that when the vital powers of the whole body are wellnigh exhausted by illness, by starvation, or by exposure to cold, one particular organ may be irretrievably blighted, though the remainder may recover their accustomed health. The amaurosis which occurs in anæmic subjects, and the wasting of one leg or arm after fever, are instances.

The *treatment* will be exemplified under the heads of atrophy of muscle and of bone.

VI. SENILE DECAY.—As man is born for a limited term of life, so each separate part of his organism, when it has attained perfection and answered its appointed purposes, begins to show symptoms of decay;—thus giving us warning that death must occur sooner or later from mere inability of the organs any longer to carry on the processes of life, even if it be not hastened by violence or disease. Some of the changes which take place in consequence of age, in the eye, the teeth, the prostate gland, and the bones, are subjects of surgical study, and will be detailed in the fourth part of this work.

It must be added that when we speak of *senile* decay, we speak of a thing "not to be measured by number of years," for some men at fifty are in all respects older and worse in constitution than others who are thirty years their seniors. It must be added, likewise, that some instances of wearing out may occur at quite an early age, as, for example, the decay of the hair and teeth; and that peculiar change in the veins which is known as varix, when they become distended and knotty from inability to support the column of blood contained in them.*

CHAPTER II.

HYPERÆMIA.

HYPERÆMIA.—Although preternatural accumulation of blood plays a most important part in that series of phenomena known by the term *inflammation*, yet it does not by itself constitute inflammation; and we have devoted this short chapter to the subject *per se*, in order that the student may be aware that a something above and beyond this is necessary to constitute inflammation, as will be shown hereafter.

Local hyperæmia may be of two kinds—1. active or arterial;—2. passive or venous. To the first the name *determination of blood*, or *active congestion;* to the second the name *passive congestion* is commonly given.

1. *Active determination* of blood is a process wherein more blood is attracted to some particular organ, and circulated through it more rapidly than usual. It is necessary to many natural and beneficial actions: as the enlargement of the womb in pregnancy, and of the breasts after delivery. It is equally necessary to many morbid actions; it forms one of the first and most palpable effects of inflammation; it is the cause of heat, and redness, and throbbing; it is witnessed in blushing; in the condition of the blood-vessels of the intestines in

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* For fuller information on the subjects of this chapter, consult Mr. Paget's Lectures, and Andral's Pathological Anatomy, trans. by West and Townsend.

malignant cholera; in headaches from excitement; and in the afflux of blood to the uterus, from ovarian excitement. The usual consequence of active hyperæmia in excess is hæmorrhage; as in sanguineous apoplexy, epistaxis, and hæmoptysis.

2. *Passive congestion* signifies a stagnation of blood in a part, especially in its veins. It may be a consequence of mechanical obstacle to the return of blood; or of atony and want of vital contractility in the capillaries, especially if they have been previously subject to great distension or excitement. It is evidenced by a sense of weight and aching pain, and is very liable to lead to serous effusion, or passive hæmorrhage, and to ulceration or gangrene.

There are two causes of peculiar force in producing local accumulations of blood. One is, mental emotion, the effects of which in directing a torrent of blood to the uterus are well known; whilst it is not less true that the act of fixing the attention strongly on any organ whatever, in either sex, is sufficient to derange its circulation. The other is, impurity of blood. Let the blood be impure from any cause whatever, from the presence of bile, urea, or lithic acid, or even let it be deficient in its proper constituents, and local congestions are sure to occur. The headaches that accompany biliary disorder, and the serous effusions which follow Bright's disease, are examples. The *treatment* of these cases must comprise the purification of the blood; the removal of mental causes; the local abstraction of blood; the application of cold; and, in passive cases, of stimulants and bandages.

CHAPTER III.

NERVOUS PAIN.

As all hyperæmia is not inflammation, so neither is all pain. Pain may arise from muscular spasms or cramp, or from some diseased condition of the nerves, or of the nervous centres, without the existence of the least inflammation. Such pain, nervous pain, as it is commonly called, may often be known by its capriciousness; by its coming and going without apparent cause, or with no other cause than the patient's mind being directed to it. It is often intermitting. It is often relieved by measures that would aggravate inflammation, such as stimulants, pressure, and friction; and almost infallibly aggravated by leeches, blisters, and other remedies that would relieve inflammation if it existed. It is often intense in proportion to the anæmic and debilitated condition of the patient. It is often intense out of all proportion to heat, swelling, and redness, even if they are present at all. In its character it is often violently plunging or shooting, and is compared by the patient to the running through of a red-hot wire, or the passage of an electric shock. It may last for weeks or months without being followed by any of the changes of structure which are commonly called inflammatory. Lastly, it may be felt in parts quite remote from any morbid action, or may be referred to parts of the body destitute of sensation (thus after fracture of the spine severe pain has been felt in the legs, though quite insensible to the touch), or may be referred to parts that have no existence, of which the pain felt in limbs long since amputated may be an example.

The *treatment* of this condition will be found in Part IV., under the head of Neuralgia.

CHAPTER IV.

GENERAL DOCTRINE OF EXUDATION.

EXUDATION is a process whereby certain substances are separated from the blood, either on the surface or into the substance of organs.

The cause of exudation may be, 1st. Some change in the part, as, for example, local irritation or injury; or, 2ndly. Some change in the blood, to relieve which a process of exudation is set up. A blister caused by boiling water is an example of the first order; the blisters of herpes and chicken-pox of the second.

Exudation from the surface of a part may be distinguished with difficulty from an increase or perversion of natural secretion. Exudation into the substance may pass by imperceptible gradations into hypertrophy of normal structure.

Exudation may take place with every degree of rapidity; so slowly and gently that it shall be discovered by accident, or with alarming suddenness and rapidity.

Exudation, in like manner, may vary in the amount of hyperæmia which accompanies it. The more rapid it is, the more probably will it be attended with intense hyperæmia, and with fever; and exudation, with hyperæmia, constitutes a great part of INFLAMMATION.

VARIETIES.—Every kind of derangement of the blood leads to its own form of exudation, and so does almost every kind of local injury. That derangement of blood which may be produced in almost any individual by excess of malt liquor, exposure to cold, and neglect of the bowels, causes an exudation known as the 'common inflammatory,' because it is generally attended with acute hyperæmia. Under certain morbid conditions of blood, the real nature of which is unknown, exudations take place which are recognised as scrofulous, cancerous, or the like. During certain other states of the blood, connected probably with unnatural development of lithic and of lactic acid, the exudations occur which are known as gouty and rheumatic.

But it is to be observed that no precise line can be drawn between exudations on account of the degree of hyperæmia with which they may be combined. Cancer, and the scrofulous exudation, may each be deposited with so much vascular excitement as to deserve the name cancerous or scrofulous inflammation (*acute tuberculosis*).

CHAPTER V.

GENERAL DOCTRINE OF REPAIR.

Repair not inflammation.—Since the animal body is liable to accidents, and the purposes of life could not be realised if every injury produced death or permanent disability, it is evident that a provision for repair, within certain limits, is as essential as that for daily nutrition. Within our own times, indeed, it has been customary to assume that all repair was an effect of inflammation. But a more precise pathology requires us to separate repair, a process beneficial, gentle, and painless, from inflammation, a process injurious, violent, and painful. True it is, that both repair and inflammation have the one feature, exudation, in common; and that some cases of repair are more or less complicated by inflammation; and that an exudation induced by inflammation may, after the inflammation has ceased, serve the purpose of repair. Yet the *material* exuded in the best examples of repair differs from that which is exuded in inflammation; and of all repair, it may be said that it is perfectly and rapidly executed in proportion as every symptom which can fairly be called inflammatory is absent.*

What amount of repair is possible?—This is a question, like many others, of which a broad view cannot be obtained by attention to human anatomy and pathology alone. In some of the lowest animals, as the polyp, repair seems to be almost unlimited, any portion of a severed animal being able to reproduce all the rest: whole limbs, too, are reproduced in the lobster and the lizard. But in the higher animals it is only the commonest structures that can be restored: for example, to quote from Mr. Paget:—

"1. Those which are formed entirely by nutritive repetition, such as the blood and the epithelia.

"2. Those which are of lowest organisation and (which seems of more importance) of lowest chemical character; as the gelatinous tissues, the cellular and tendinous, and the bones.

"3. Those which are inserted in other tissues, not as essential to their structure, but as accessories, as connecting or incorporating them with the other structures of vegetative or animal life: such as nerve fibres, and blood-vessels.

"With these exceptions, injuries or losses in the human body are capable of no more than repair in its most limited sense—*i. e.* in the place of what is lost some lowly-organized tissue is formed, which fills up the breach and suffices for the maintenance of a less perfect life."

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* On the subject of this chapter, the student should thoroughly master the chapters on Repair and Adhesion, in Hunter on the Blood; Travers on Inflammation, a work in which the venerable author treats of Inflammation almost as the one disease, and as the agent of all repair; Macartney on Inflammation, which has laid the foundation for the modern reform of opinion; and the masterly summary of the whole subject in Paget's Lectures, vol. i.

It appears that amongst the various powers which the mind can discriminate amongst the compound processes of life, a distinction must be made between *nutrition* and *development*. Nutrition keeps any given tissue in a healthy state *quantitatively:* it provides for bulk, for increase, and for repetition of like parts. Development, on the other hand, acts *qualitatively:* it is that power which causes the *differentiation* of tissues, the unfolding and perfecting of new structures, and display of new powers. Increased nutrition, as Mr. Paget shows, is displayed in the multiplication of similar parts—petals—when a single flower is converted into a double one. Development is shown by the conversion of petals into reproductive organs—stamens and carpels—parts endowed with far higher functions.

Now the power of development—or of *germ force*—the power which presides over the changes which ensue in the whole of life, is much more limited than nutrition. It is greatest at the earliest times of life. In the early human fœtus, it is believed that rudimentary fingers and toes may be restored, after loss of a hand or foot. Hence the rule enunciated by Mr. Paget, that the greater the amount of transformation and development which has been expended in bringing an animal to the perfect state, the less will be the amount of repair possible.

Seeing, then, that the *tissues capable of being reproduced*, are the connective or areolar tissue, including tendon and ligament, bone and cartilage, blood-vessel and nerves, but not more complex structures, such as muscle, we may next observe that

The MATERIAL employed is the *liquor sanguinis*, or fluid part of the blood; but especially that constituent of it which has the power of spontaneous coagulation, and which is commonly known as *fibrine* or *coagulable lymph*. Not the pure fibrine of the chemist, as Mr. Paget observes, but fibrine as it exists in nature, with a certain share of oily and mineral ingredients.

The natural tendency of this material is to develop itself into fibrous or connective tissue, which in certain cases may be further developed into cartilage or bone. But there is a diversity in the steps by which the earliest stages may be accomplished.

1. In one mode, the fibrine *sets*, or solidifies into an opaqueish granular mass studded with small oval nuclei, which, like other nuclei, are rendered more distinct by acetic acid. Within a certain time the lymph acquires a distinctly fibrous structure, and the nuclei also probably elongate themselves into fibres. This mode is called by Mr. Paget that by *nucleated blastema.**

2. In the other mode the fibrine develops itself into a mass of large *nucleated cells;* which subse-

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* Nucleated blastema. After Paget, Lectures, vol. i. p. 187.

quently enlarge, elongate, split into the shapes known as *caudate*, *fusiform*, &c. The first step is believed to be the accumulation of *granules*, to form a *nucleus*; or at least the enlargement of granules into nuclei: about these, as by a kind of attraction, other matter adds itself, so as to form a cell. Such cells imbibe water, under the microscope, which shows them to be separable into cell wall and cell contents, and the addition of acetic acid renders every part transparent and almost invisible, except the nucleus. At first their dimension is about $\frac{1}{2000}$ of an inch. They are imbedded in more or less of the original exudation, pellucid, or fibrillary.

As their development proceeds, they elongate, and split up into fibrous tissue. The destination of the nuclei is uncertain.

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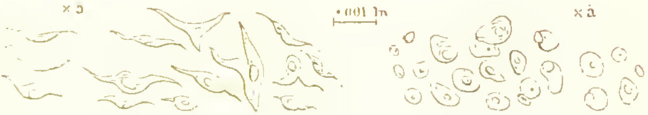

These cells will often be spoken of in the following pages as *fibro-plastic cells*. They are formed in abundance, as we shall presently see, in all the less perfect examples of repair. They are found as some of the commonest results of inflammation. They constitute granulations. They also constitute the basis of most tumours and morbid growths. They are liable to degenerate into pus. And when diseased or perverted they may be supposed to constitute the material of cancerous tumours.

But be it observed that although these cells are evolved under certain conditions out of the exudation which takes place during inflammation, yet that the absence of inflammation is essentially necessary before they can assume their full degree of development into tissue.

Blood organisable, yet not the ordinary material of repair.—In a less perfect state of knowledge it was supposed that the blood was the common medium of reparation. We now know that this is not the case; that effused blood is a hindrance rather than a help; that the clot which is effused from an injury is absorbed before the work of repair is perfect; and that if clots of blood be present in large quantity they are apt to lose their vitality, and to cause suppuration. Yet it is quite true that thin clots of blood, under certain circumstances, are capable of undergoing a change into a fibrillated material similar to the nucleated blastema, and of receiving blood-vessels. Mr. Prescott Hewett showed, some time ago, that thin layers of blood effused into the cavity of the arachnoid may become vascular: it was also proved by Hunter, Macartney, Kiernan, and Dalrymple, that clots are capable of receiving blood-vessels.*

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* This cut represents, on the right of the page, fibro-plastic cells, of various sizes and degrees of development; on the left, cells which are developing into fibres; those at either end, marked × ā, have been treated with acetic acid. Traced with the camera from actual specimens from granulations, healing wounds, and fibro-plastic tumours, magnified 200 diameters. The scale of ·001 inch will give an idea of the real magnitudes.

Formation of new vessels.—Twenty years ago, nothing was supposed to be organised which had not blood-vessels: and to *become vascular*, and *organised*, were used as convertible terms. Now, however, we know, as, in fact, was known but not reflected on before, that blood-vessels play a subordinate part; and that organisation proceeds to a certain point before they appear on the stage: yet that they are necessary at a certain epoch, in order that the material for fresh growth may be brought within reach. The readiest way for the student to watch the formation of new vessels, will be to examine the lymph found on the edge of a placenta. There he may see the results of the process described by Paget, the budding out of branches from the nearest capillaries, which branches enter the developing lymph, and inosculate with each other, so as to form loops: from which, again, fresh loops are directly given off in like manner.

The time within which repair is effected varies as greatly as the nature of injuries and of ages and constitutions. But vascularity, or propulsion of new blood-vessels into a new fibrinous exudation, may occur certainly in less than forty-eight hours, whilst in the progress of granulation, the layer of lymph effused in one day appears to become vascular by the next.

Conditions favourable for repair, and the reverse.—1. In the first place, bearing in mind what has been said of the exhaustion of power of development, it is evident that, *cæteris paribus*, the younger the system, the more capable is it of repair. 2ndly. The state of the blood may be so poor as not to yield the necessary material; or it may be so overloaded with ill-assimilated material, or so poisoned, that the lymph effused is ill capable of development, and runs into degeneration. 3. *Local conditions* may be such as to afford mechanical or chemical complications. The effused matter if disturbed may perish, or if exposed to air or to poisonous influences, may undergo degeneration into pus, which may infect the whole blood. In general terms, whatever favours inflammation is hostile to repair, and the converse.

Injuries with wound of skin, and without.—Here we are discussing general principles; in their proper place we shall say more of the specific instances of repair. Meanwhile we may divide cases into two great categories—those attended with wound of skin, and those without: and state how infinitely more dangerous and difficult of repair the former are, as evidenced by compound fracture and dislocation, and by wounds of the great visceral cavities, compared with the severest bruises and simple fractures. The reason of the difference is the fact, that exudation exposed to the air and contact of the outer world is more liable to perish, and, having perished, to run into unwholesome changes, which may spread over the whole internal surface injured. It is a principle derived from this fact, that wounds of the skin are to be avoided when possible, and, when unavoidable, are to be as limited as possible: and that the *subcutaneous method* originally used for the division of tendons should be extended to every case admitting of it.*

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* Vide Palmer's ed. of Hunter, vol. iii.; Catalogue of the Hunterian Museum, vol. i.; Carswell, op. cit.; Macartney, op. cit. p. 51; Home, Phil. Trans. 1818; Wardrop on Aneurism, in the Cyclop. Pract. Surgery: Dalrymple, Med. Chir. Trans. vol. ix.; P. Hewett, *ibid.*, vol. x.; see also Lancet for 1845, vol. i. p. 219; Paget's Lectures, vol. i.

In other parts of this work we describe the repair of abscesses and ulcers by granulation and cicatrization; the repair of wounds, of fractured bones, and of divided tendons.

CHAPTER VI.

INFLAMMATION.

SECTION I.—INTRODUCTORY.

DEFINITION.—A perfect definition of inflammation is at present impossible, forasmuch as we are ignorant of many of its conditions, and are not even agreed upon the processes which shall be included under the term. Perhaps we may say that it is "a diseased process, including hyperæmia, stagnation of blood, and exudation."

It is a very complex process, in which the state of the *constitution*, and of the blood, and the state of the *part affected*, require to be carefully analysed in their relations to each other.

SYMPTOMS.—The classical symptoms are four—pain, heat, redness, and swelling; to which ought to be added, impaired function of the part inflamed. Besides, there is feverishness with every true acute inflammation.

SECTION II.—ANALYSIS OF LOCAL SYMPTOMS.

1. PAIN or *dis*-ease is sure to ensue when anything in the animal economy goes wrong, and the varieties it presents in inflammation require careful study. Thus (*a*) it may vary with the local cause which has produced it: thus patients talk of cutting, burning, stabbing pains. Every idiopathic inflammation also has its own kind of pain. The exudation of boil or carbuncle causes a different pain from that of phlegmon.

b. Then the pain will vary with the part inflamed; for each part has a set of sensations peculiar to itself; the bones and ligaments ache; the skin smarts or burns; an inflamed pleura, when stretched, feels as if torn or stabbed; the inflamed ear hears unnatural sounds.

c. Inflammatory pain is aggravated by preternatural irritability, or receptivity of impressions; thus *tenderness* is created:—unusual reflex actions also are excited by impressions conveyed to the spine, and *spasms* are excited, which are so painful a feature in conjunctivitis, croup, and dysentery.

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* Sketch of Subcutaneous Surgery, by W. Adams, F.R.C.S. Lond. 1857. Refer to Tenotomy, False Cartilage, Bursæ, and Hernia.

d. The intensity of the hyperæmia causes the *throbbing* of the vessels to be painfully felt; particularly in inflammations of dense, unyielding parts, or of parts confined by fascia.

e. *Distension* by exudation causes intense pain in the like cases.

f. Pain may be felt at a distance, along the course of nerves irritated. Thus the testicles ache in irritation of the bladder. Similarly, pain may be felt along the course of lymphatic vessels and glands if they are impregnated by the inflammatory exudation.

g. Lastly, pain may be absent in slight cases. Moreover, it must be remembered that pain is a subjective symptom, and exists in the consciousness of the patient; and though the conditions for it exist, it may not be felt if the nerves are severed, or the brain stupefied by disease, alcohol, or narcotics.

2. The *heat* of inflammation is a direct consequence of hyperæmia. It is in great measure a *sensation*, and chiefly felt in inflammations of surfaces; but (as Hunter showed) as an inflamed part receives more blood, so it is hotter than other parts; but yet it is not hotter than the mass of the blood.

3. The *redness* is another consequence of the hyperæmia, and its appearance, depends, in some degree, on the natural arrangement of the vessels of the part; thus, inflammation of the conjunctiva differs in appearance from that of the sclerotic. But it is still more influenced by the cause of the inflammation: thus the vivid blush of phlegmon, gradually fading into the natural hue, differs materially from the abrupt red, dusky patch of erysipelas. Moreover, the colour is often modified by blood exuded into the inflamed part, as in boil and erythema nodosum; or by a peculiar condition of surface, as in syphilitic lepra: so that almost every inflammation has its own colour; and one—the phlegmasia alba dolens—is remarkable for having no colour at all.

4. The *swelling* is caused first by the hyperæmia, then by matters exuded into the inflamed tissue. These may be hard and brawny as in carbuncle, or soft, so as to allow the pressure of the finger to make a pit.

5. That inflammation must impair function is obvious. Motion is difficult or impossible; sensations exaggerated; and secretion diminished, and mixed with serum or fibrine.

SECTION III.—ANALYSIS OF CONSTITUTIONAL SYMPTOMS—TRAUMATIC, OR SYMPTOMATIC FEVER, OR FEVERISHNESS.

The word *fever* is now so wedded (although very improperly) to certain species, as typhoid and typhus, that perhaps it is better to use the word *pyrexia*, or *feverishness*, to express the sum of the constitutional symptoms attending acute inflammation.

The relation of the constitutional symptoms to the local may be one of these three:

1. The constitutional symptoms may precede and cause the local: as in common idiopathic inflammations, erysipelas, pleurisy, pneumonia, &c.

2. The constitutional symptoms may follow and be caused by the local; when the blood circulating through an injured part becomes contaminated by decaying animal matter, or by the irritation of the nerves; as in the case of acute inflammation following an ill-closed and irritated wound.

3. The constitutional having been caused by the local malady, may again be the cause of other local diseases elsewhere—as in pyæmia, and secondary suppurations.

Fever consists, as may be proved by experiment and by reason, (1.) in a change of the blood: (2.) in a series of operations for purifying the blood so changed;—by increased oxygenation—by increased secretion—and by exudation—or by all three.

SYMPTOMS.—1. The first in order of time is *shivering*;—trembling of the muscles, sensation of cold, and, in severe cases, blueness, and shrinking of the features, and the other signs of abstraction of heat from the body. Its real nature is unknown: but the student will do well to regard *shivering* as a most important symptom at any stage of any disease, inasmuch as, to use Hunter's words, it surely indicates "some new action set up in the blood." *Vomiting* is sometimes combined with it.

2. The *pulse* is raised to 100, 120, or more. In some cases it is hard and wiry; in others soft and jerking.

3. The *respiration* is also increased—to 25 or 30 in adults: in children to twice that number.

4. The *heat* is raised to 102—104 degrees; in some cases probably higher.

5. All the watery *secretions*—of skin, mouth, and urine—are suppressed. Food is loathed, but acids and water craved for.

6. *Headache*, wandering at night, and lassitude, testify to disorder of the nervous system.

7. The *urine* shows remarkable changes. Before an idiopathic inflammation it is often pale, and during the height it is usually scanty and high-coloured—at the close, copious, and turbid with sediments of lithates. There are some exceptions to this, inasmuch as the increased excretion of lithate may begin before the disease, and cease earlier. During the height of acute inflammation, it is often albuminous—it contains serum from congestion of the kidneys, and tubular casts. Speaking generally, the uric acid, extractive matters, and specific gravity of urine are greatly increased during acute inflammation. The sulphates are at or above the usual average: the chlorides greatly diminished.

The *diminution of the chlorides* in the urine, which had long been known on the Continent, was introduced to the English profession, and the amount of facts greatly increased, by the researches of Dr. Lionel Beale, who has shown that every process of rapid development by cell growth in health or disease requires the presence of large amounts of chloride: (the ash of a fœtal thigh-bone, for example, contains much more per cent. than that of an adult); and that when any diseased process of exudation and cell growth is set up, the salt is withdrawn from the blood and urine, and is present in the infiltrated tissue.[*]

8. That the *state of the blood* is peculiar during acute inflammation is proved by the fact that when drawn its surface is almost immediately covered with a bluish layer, like size: whence inflammatory blood was formerly called *sizy*. So soon as the blood has coagulated, this layer is visible as a yellowish-white stratum on the surface of the red clot; and as it generally contracts so as to make the upper surface of the clot concave, the technical terms *buffed* and *cupped* have been applied to this kind of blood.

Various theories have been proposed to account for this: for example, *slow coagulation*, so that the red particles have time to sink and leave the upper surface of the clot colourless; and *increased attraction* of the red particles for each other, so that they form themselves into a network of rouleaux, and sink with unusual rapidity: this is the view of Mr. Wharton Jones. Slow coagulation undoubtedly exists in most cases of inflammatory blood, and on Dr. Richardson's theory[†] that *ammonia* is the solvent of fibrine in blood, the slow coagulation may depend on excess of the solvent, or on slow evolution thereof. Besides, there may be an absolute excess of fibrine: and it must be remembered that, besides fibrine, the white particles of the blood sometimes constitute a great part of the buffy coat; and that the fibrine is supposed to be in a highly oxidized state—deutoxide or tritoxide of protein.

The *chemical composition* of inflamed blood differs, according to Ancell, Simon, Becquerel, and Rodier, from that of healthy blood, in a diminution of the red particles and an increase of fibrine: which last condition is now commonly designated *hyperinosis*, which signifies *over-fibrination*. Becquerel and Rodier state, that in the phlegmasiæ the fibrine is increased invariably; that the increase begins with the beginning and lasts to the end, and is proportionate to the intensity of the inflammation; that it is present whether inflammation be the sole disease or be an accidental complication; that blood-letting does not lessen its over-proportion.

Most authorities agree, too, that the hyperinosis is in some way connected with excessive oxidation of the blood; although Becquerel and Rodier believe it to be produced by an oxidation of the albumen; and Simon by an oxidation of the blood corpuscles.

Hyperinosis is, as a rule, present in all acute inflammations; everything that ends in *itis*—bronchitis, pneumonia, carditis, peritonitis, and the like: in acute rheumatism, especially; also in erysipelas, puerperal phlebitis, phlegmasia dolens, tubercular phthisis, and in pregnancy. The proportion of fibrine may be increased from about 2·5, the normal proportion, to 5, 7, or 10 grains per 1000. In typhus fever, typhoid, and the exanthemata, an opposite state exists, called *hypinosis*.

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[*] Fränckel und Ravoth, Uroscopie, Berlin, 1850; Beale, Med. Chir. Trans. 1852; Simon, Animal Chemistry, vol. ii.

[†] See W. Hewson's Works, a medical classic that well deserves study; Wharton Jones, Guy's Hosp. Rep. vol. vii. N.S.; Richardson on Coagulation of Blood. Lond. 1858.

SECTION IV.—MINUTE ANATOMY OF AN INFLAMED PART.

An inflamed part has a large quantity of blood intruded into its vessels; and its tissues and their interstices are *infiltrated* with liquids which have exuded from those vessels. If examined after death, it is *softer* than a similar sound part, for the hardest tissues seem to lose some of their cohesion. It is also redder, although mere redness, *post mortem*, is no proof of inflammation, for it may be produced by congestion or by a staining of tissues with dissolved blood pigment which has oozed out of the vessels in incipient putrefaction.

The tissues involved in an inflammatory exudation (as in cancer and every other exudation) always show signs of "fatty degeneration," inasmuch as their true structural markings are confused, and they are infiltrated with minute globules of oil, and soon are liable to be liquefied and absorbed. In articular cartilage, the cells, as Dr. Redfern has observed, are enlarged, and the intercellular substance split up. Besides this, they are greatly influenced by the changes which take place in the exudation, whether towards development or degeneration. If a fibrinous exudation becomes organized, the proper tissue of the part is starved as vegetables are by weeds. If it soften into pus, they become liquefied with it.

[*]

Microscopical Observations.—Many attempts have been made to see the exact phenomena of inflammation, after they have been excited by irritants applied to the transparent parts of animals—a thing difficult of attainment, because it must be difficult to distinguish between the chemical effects of an irritant on the blood and vessels, and the genuine effects of inflammation. But the following particulars may be gathered from the researches of Mr. Paget and Mr. Wharton Jones.

1. The primary effect of a slight stimulus applied to the blood-vessels, is a slight and temporary *contraction*, with a *retardation* of the current through them. If the point of a fine needle be drawn across a minute artery and vein three or four times, without injuring them or the membrane covering them, they will both presently gradually contract and close. This contraction is no doubt analogous to the speedy closure of the innumerable small vessels divided in a wound, which are made to contract by the very stimulus of the instrument which has divided them.

2. During this contraction, the blood moves more slowly, or perhaps does not move at all. But when the vessels dilate again, they acquire a larger size than they originally had, and the blood moves more freely and rapidly through them than it did before. And now the same stimulus that made them contract at first has no effect, or a very tran-

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[*] Portion of muscle involved in inflammatory exudation; fatty degeneration of the muscle; and infiltration with fibro-plastic matter.—From nature.

sient one; a more powerful stimulus, however, may make them again contract and close.

On applying a more powerful irritant, such as a drop of tincture of capsicum, the preliminary contraction, if it occur at all, is so transient as to be hardly perceptible, but the phenomena of *active congestion or determination of blood* become instantly developed. The blood-vessels become rapidly dilated, lengthened, and tortuous; sometimes even they display varicose or aneurismal excrescences; they are tensely filled with blood, containing a large excess of red globules, which is circulated with far greater velocity than is natural.

3. But if the injury inflicted be of still greater severity, as a wound with a red-hot needle, then in addition to the preceding state of active congestion, there follows, in the very focus of the morbid changes, a retardation, and, at last, a complete stagnation of the blood in the densely-crowded capillaries. "All round this focus the vessels are as full, or nearly as full, as they are in it; but the blood moves in them with a quicker stream, or may pulsate in the arteries, and oscillate in the veins; yet farther from this focus the blood moves rapidly through turgid but less full vessels." The dusky colour in the centre of a phlegmon; the throbbing; the red blush around; the gush of blood on cutting into it, are thus fully explained.

The exudations which are poured into an inflamed part may be, 1, blood, by rupture of distended capillaries; 2, liquor sanguinis, which then separates into serum and fibrine; the fibrine being attracted to the focus of the inflammation, and the serum infiltrating the parts around; 3, serum alone; 4, fibrine alone.

SECTION V.—PROGRESS AND TERMINATIONS.

Inflammation, once established, may destroy life, either by impeding the functions of some organ necessary to life, as the heart, lungs, or brain; or by quick exhaustion or syncope, as in inflammation of the abdominal organs; or by slower exhaustion, from suppuration.

Or it may end in complete subsidence (*resolution*, as it is technically called) and recovery, provided that the blood be purified from all source of morbid exudation; and that local irritation be done away with. Then sleep, appetite, and moisture of the skin return; the pulse becomes natural; and the urine deposits a copious brick-dust or *lateritious* sediment of lithate.

As to local changes. The first effect of inflammation on the tissues is probably an exudation of serum. This is succeeded by liquor sanguinis, the fibrine of which becomes solid, constituting the material of the *adhesive inflammation*. Here one of three things may happen. (1.) The inflammation may cease, and the exudation be absorbed; or (2.) the exudation may remain and develop itself into fibro-plastic matter or adhesions; or (3.) it may soften into the liquid called pus.

Thus we can understand the Hunterian theory of the different effects produced by differences in the intensity of inflammation.

which decreases as the distance from the centre increases. Thus at the outskirts of an inflamed part there will be a ring of serous effusion or œdema: within this a solid layer of fibrine, which forms a sac, within which is pus, formed by the softening of the central fibrine. If to the *serous effusion*, *adhesion*, and *suppuration*, thus present, we add *hæmorrhage* (for there is always some, often much blood extravasated in acute inflammation), and *gangrene*, or the death of some of the tissues involved, and *ulceration*, or a process of disintegration by which pus is discharged, we have the six processes commonly called *terminations*, or effects of inflammation; although, be it observed, every one of them singly may occur quite independently of inflammation.

SECTION VI.—CAUSES AND VARIETIES OF INFLAMMATION.

The CAUSES are of two kinds—*constitutional* and *local*, of which the former deserve precedence, inasmuch as, without appropriate blood material, no inflammation can be perpetuated.

1. The *constitutional* causes may be of the most opposite kind, although they all have the common property of rendering the blood impure. Excess in meat, wine, and stimulating food; and deficiency of food; inactivity and respiration of close air; or over-exertion and fatigue; imperfect action of the liver, kidneys, and skin; and great exhaustion of mind; besides the poisons of decaying animal matter in various stages, and animal or zymotic poisons.

Cold, continuously applied, may disorder the whole blood, and bring on an idiopathic inflammation, or may cause inflammation of the part chiefly subjected to it.

2. The *local causes* are injuries of all kinds, whether from within, as over-exertion and excessive wear and tear, or from without, as mechanical and chemical injuries of all sorts. But, as we have before said, injury is not of necessity followed by inflammation: on the contrary, repair may go on quietly, unless the blood of the injured person be in a state inadequate to furnish healthy reparative material, or unless the injury be such as to destroy the life of certain tissues (as poisoned wounds); or unless the processes of repair be rendered difficult by the kind of wound (as an open jagged wound that cannot be closed), or by ill treatment, such as interferes with the exuded matter and hinders its development.

The VARIETIES of inflammation depend on the cause, and on the kind of constitution conjointly. Thus we read of

Sthenic or active inflammation, which is the disease as it affects a vigorous person.

Asthenic, or *low*, or *weak*, which is the disease of a weak, asthenic person: or which may be produced by certain causes of a lowering nature, as hospital air, and other poisons. It is more obstinate and less amenable to treatment than the active or sthenic.

Common inflammation is that which may be produced by ordinary causes in most individuals.

Specific inflammation requires a specific set of causes, chiefly animal poisons, or a peculiar state of blood.

The chief specific inflammations are gout, rheumatism, syphilis, gonorrhœa, erysipelas, phlegmasia dolens, glanders, and pyæmia; croup and diphtherite; boil and carbuncle; erythema nodosum, eczema, lepra, and most skin diseases. And every variety of cause produces its own train of consequences. This point is very clearly stated by Dr. Budd.* Take inflammation of the knee-joint for an example. If caused by a penetrating wound, with admission of air, rapid suppuration and destruction of the joint usually follow. If caused by the presence of pus or decaying fibrine in the blood, there will be little swelling, but suppuration so rapid as to encourage the belief that the pus, instead of being formed in the joint, is brought there. If caused by rheumatism, there is severe pain, and much effusion; but that effused fluid is never purulent, and is almost always absorbed as the patient recovers. If of gouty origin, there is more pain and considerable effusion, which is apt to leave particles of lithate of soda behind in the synovial membrane, and in the areolar tissue around. If a consequence of gonorrhœa, there is abundant effusion, and great swelling, very difficult to get rid of.

Sthenic inflammation is generally *circumscribed*, and most intense at one central point. Asthenic inflammation, especially from poisons, is often *diffused*, *i. e.* wide spread, with no efficient boundary to the softened exudations.

Moreover, every cause which produces inflammation through the blood, seems to have its own favourite seat; the poison which causes measles will not cause croup nor chicken-pox; gout affects the great toe by preference, erysipelas the scalp.

Yet there are certain *local predisposing causes*, which, *cæteris paribus*, render some parts more liable than others to be the seat of inflammation. Thus if any joint have been injured or overworked it is more liable to be the seat of gout.

There are yet some other classifications of inflammation with which the student ought to be familiar; for example: *Acute* inflammation is that which runs though its course quickly; *subacute* is a mitigated acute inflammation; *chronic* is less violent, and tends to last indefinitely.

We read also of œdematous, adhesive, hæmorrhagic, ulcerative, and gangrenous inflammation, according as the disease tends to produce either of those effects respectively.

Lastly, in the pathology of thirty years ago, it was customary to suppose that the effects of inflammation depended on the part affected; thus we heard of mucous, serous, and fibrous inflammation; and much was made of an alleged final cause, in the fact that mucous membranes generally suppurate if inflamed, and that serous membranes generally adhere by lymph. This is true; but it is not true that the exudation of lymph from mucous surfaces is impossible or rare, although the rapid production of fresh layers of epithelium or pus tends to cast it off and prevent it from becoming organised; and thus the obstruction of mucous canals is prevented.

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* On Diseases of the Liver, 2nd ed. Lond. 1852, p. 65.

SECTION VII.—THEORY OF INFLAMMATION.

Physicians have in all ages wished for such an intelligible conception of the process as would enable them to connect it with the other classes of facts of which they have scientific knowledge. But it is quite certain that we can have no clear conception of disease till we understand health; and that all the theories of inflammation that have been framed are, for the most part, preconceptions in the mind of the theorizer, who merely applies to the phenomena such philosophy as he may have. Thus in the time of the ancients, when the arteries were believed to hold air, it passed for a decent theory of inflammation to assume that blood had found its way into them, as Celsus narrates. In the earlier humoral pathology, ill-humours of various sorts were supposed to fall upon the organs affected. The words defluxion, gout, and catarrh, are relics of this theory. Mathematical physicians of the school of Mead supposed the vessels obstructed by aberrant particles whose size and shape would not allow them to pass. Hunter and his school spoke of inflammation as *excited* action of blood-vessels. The earliest microscopists of the present century, Wilson Philip and Hastings, saw in the dilated and gorged vessels nothing but relaxation, debility, and want of action. Whilst the doctrine of action of blood-vessels was prevalent, Gendrin, Mayo, and others showed elaborately how the successive stages of inflammation were so many mechanical consequences of different degrees of obstruction or relaxation of blood-vessels. The school of Liebig saw in it increased oxidation. The modern explorer of the blood sees in it the results of hyperinosis, or other changes in that liquid. The modern microscopic physiologist sees abnormal conditions of nutrition and of attraction between the blood and tissues.

Then it must be noticed, that the search for a theory has been like the search for the philosopher's stone, or for the Grand Arcanum; when found it was to be a key to all difficulties, and to show the right plan of treatment. He who believed increased action to be the essence of inflammation, of course drained the blood-vessels, starved the stomach, and used every poison capable of "lowering the heart's action." He who saw debility in the distended vessels proposed stimulants. He who sees oxygenation of the blood, proposes remedies calculated to diminish oxidation. One theorist proposes remedies that shall hold fibrine in solution, and so on of the rest.

But each of these suppositions may be true to a certain extent: there may be increased action of the arteries, debility of the capillaries, increased oxygenation of the blood, and perversion of nutrition; but yet these are but accidents and accompaniments of a process whereof we are not able to grasp the essence. HE only who knows and sees all things can frame a perfect theory.

Yet as a reasonable being can scarcely help framing to himself some explanation of processes which he sees, (although to a wise man a theory is a thing to use, and abandon when worn out, not to be enshrined as an idol), so we may be expected to give some probable explanation; and the best we can frame is this:—

Idiopathic inflammation is the formation of a temporary organ of elimination whereby the blood separates from itself some noxious matter, which is poured into the inflamed part with the inflammatory exudations. The blood meanwhile undergoes a process of oxygenation, whereby spoiled material is reduced to a state fit for elimination by the liver and kidneys; and if that be quickly accomplished, local mischief ceases.

Traumatic inflammation is caused by changes which take place in the injured part; the blood (perhaps unhealthy to begin with) becomes changed by decaying blood or exudation at the injured part, which has been incapable of, or prevented from, developing itself; or else through the operation of pain and irritation of the nervous system.

SECTION VIII.—ACUTE INFLAMMATION.

DEFINITION.—Acute inflammation is that which is sudden in its origin, violent in its action, and rapid in producing some one of the so-called effects of inflammation; and it is attended with fever.

We may observe, at the outset, that the surgeon should always estimate the natural tendencies of the particular kind of inflammation, the cause that it depends on, and the organ which it affects. He should consider the necessity, which there is in some cases, of immediate relief, in order to save life, whilst in other cases the disease tends to run a certain course, and then decline of itself; and the possibility there is, in some cases, of removing the disease entirely, in others, of only mitigating it.

TREATMENT.—Generally speaking we should say that the indications are, 1. To remove the cause. 2. To eliminate from the blood the source of morbid effusion. 3. To allay and soothe the disturbance of vitality and sensibility in the injured part. 4. To moderate the afflux of blood. 5. To hinder degeneration in the fluids exuded, and procure their absorption.

We shall proceed to speak in this order of the means by which each indication may be fulfilled.

1. *To remove causes.*—The taking away of any irritating substances, such as thorns and splinters, and placing every injured part under such conditions that the reparative exudations shall not be disturbed, are so obviously necessary as to require no mention.

2. *To purify the blood.*—In most cases, and more especially if the complexion is muddy, the bowels confined, the tongue foul, the urine either loaded or preternaturally pale, a dose of from one to five grains of calomel may be given, and followed by black draught, castor oil, colocynth, or some other purgative, and repeated so long as the stools continue lumpy, dark, bilious, and offensive, or until they are inodorous and serous. In gouty cases, the acetic extract of colchicum may be combined with the calomel. See F. 33, et seq.

The kidneys and skin may most usefully be made to perform their functions by warm baths; by cold, saline, and alkaline draughts, F. 58, lemon-juice, seltzer-water; by small doses of antimony, or of colchicum, F. 68, 69, &c.

3. *To allay the irritation of the affected part.*—This is a most important indication in the prevention and treatment of inflammation. All pain and sense of injury should be tranquillised if possible. For this purpose, in most cases, warm fomentations are advisable, particularly if medicated with decoction or extract of poppies, F. 121.

Warm fomentations (96°—98° Fah.) relax the skin, soothe pain, and promote perspiration, and likewise hasten suppuration when that is inevitable. They are especially indicated in inflammations of dense tendinous parts. But in every case the patient's feeling should be consulted, and the application be warm or cold according to his choice.

Injured or inflamed parts should be kept at rest, in an easy position, and should be elevated slightly, so that the return of blood may not be hindered.

To fulfil this indication, *opium* and other anodynes are of the greatest value. They should be given after injuries and operations, in such quantities as to keep the mind tranquil, and prevent the patient from concentrating his whole thoughts upon the part affected. They tend to diffuse the blood generally, and to prevent local congestion, and they save the exhaustion of pain and spasm. In most cases of acute idiopathic inflammation it will be expedient, before administering opiates, to take care that the blood is well purified; and whenever bleeding is necessary, that also should be executed first of all. But in inflammation of the bowels, in which repose is essential, in *low* inflammation arising from morbid poisons, or in exceedingly debilitated or exhausted states, with a soft, rapid pulse, it is of infinite service, and may be given at once. Henbane, hemlock, and the extracts of aconite and belladonna, are likewise of great use in many cases as anodynes, and though they have not the soporific virtues of opium, yet neither do they lock up the bowels. Vide F. 30, 32.

4. *To moderate the afflux of blood.*—Since the determination of a large current of blood to the affected part, and its stagnation therein, are leading phenomena in acute inflammation, it cannot be wondered at that means for controlling this afflux are of the very highest consequence. First amongst these stands—

Bloodletting.—A measure life-giving in its proper use, and deadly if abused. Its benefits may be explained on any theory. By diminishing the mass of blood, it lessens the labour of the heart and lungs, and allows the remaining blood to be oxygenated and purified by natural influences. It diminishes the rush of blood to the inflamed part, and allows distended venous capillaries to empty themselves. It decreases the specific gravity and increases the absorptive power of the blood; it promotes the action of the skin and bowels; and it imitates the spontaneous hæmorrhage by which nature often gives great relief.

Manner of Bleeding.—General bleeding should be executed in such a way as to cause slight faintness as quickly as possible. For this purpose the blood should be drawn as quickly as possible, from a large orifice; and, above all, the patient should sit or stand upright. For if the blood is drawn slowly, so that the vessels have time to adapt themselves to their diminished contents, or if the patient is lying down, so as to assist the flow of blood to the brain, the bleeding may be continued almost to death without the occurrence of faintness.

Quantity to be taken.—As a general rule, the blood should be permitted to flow till paleness of the lips, lividity about the eyes, sighing, nausea, fluttering pulse, and relief of the pain, indicate the *approach* of faintness; but *full* faintness should always be avoided.

The quantity required to produce this effect, on a healthy adult, was ascertained by Marshall Hall to be about 15 oz.; but in robust adults affected with acute inflammatory or congestive attacks of the head or viscera, a greater quantity may be taken.

The class of patients whom it is allowable to bleed, as a general rule, are the robust with red lips, firm muscles, rustic open-air occupations, firm pulse, and rigid fibre. If the lips and conjunctiva are pale, showing deficiency of blood; if the patient is bulky, soft, and flabby; if there is any weakness or degeneration of heart; or if there is any continuous disease of assimilation—scrofula, Bright's disease, or the like—bleeding can scarcely be thought of.

The class of inflammations in which bleeding is permissible are those of sthenic inflammation of vital organs. It is not allowable, as a rule, in the *hypinotic class* of maladies, nor in erysipelatous diseases; nor in the case of injuries requiring great constitutional efforts for their reparation, as compound fractures; nor if the disease be advanced towards suppuration or gangrene; and very seldom indeed in the case of any zymotic disease, or inflammation having a natural tendency to recovery.

Local Bloodletting.—Whilst it must be admitted that in a past generation general bloodletting was carried to an injurious excess, in the present day it is to be feared that local bloodletting is too much neglected. It is a most obvious, rational, and mild process; and it imitates and seconds the efforts of nature by removing some of that blood which may be assumed to be impure, and by taking it from the part where it is in excess.

The *local means of abstracting blood* are leeches, cupping, and scarifications. In order to apply leeches, the part should first be washed, and if they will not stick, a little milk or blood should be smeared on it, or some small punctures should be made with the point of a lancet: and the leeches should be well dried in a cloth. The best plan of stopping hæmorrhage from leech-bites is to dip small pellets of lint in the tinct. ferri sesquichloridi, and press them on the holes for a few minutes. Other plans are to pinch up the skin and insert a finely-pointed pencil of lunar caustic into them, to touch them with a red-hot knitting-needle, or to stitch them up with a very fine needle and silk, or to apply a small piece of *matico* leaf. But in order to prevent the very serious consequences that sometimes happen from this source to children and delicate persons, directions should always be given that the bleeding from leech-bites should be stopped before the patient is left for the night. Moreover, it will be prudent to apply them over some bone, so that the pressure may be applied effectually. Again, leeches, if they stick too long, should be removed by touching them with salt, and should not be pulled off forcibly; nor should they be applied to the eyelids or prepuce, otherwise they will probably be followed by œdematous swelling. *Cupping*, when it can be adopted, is a more active measure, and relieves pain sooner than leeches. *Punctures* are of use in superficial inflammations of the skin; *incisions* are of use when inflamed parts are covered with a dense unyielding fascia, as in whitlow; or when there is great tension, as in phlegmonous erysipelas; or when the inflamed part is infiltrated with an irritating fluid, as in extravasation of urine, or with unhealthy matter, as in carbuncle.

Cold applications are valuable means of diminishing afflux of blood, relieving morbid sensation of heat, and causing contraction of the capillaries; but they should be applied continuously, otherwise the pain will be aggravated when the heat returns. They should be applied by means of a single piece of thin linen frequently changed; and care should be taken that the vapour may pass off freely, otherwise the cold lotion will soon be converted into a hot fomentation. In some severe cases, ice or frigorific mixtures (F. 114) may be applied in bladders. The following very effectual means of applying a continuous degree of cold is recommended by Dr. Macartney. The inflamed limb is to be placed in a trough or piece of oilcloth, with a piece of lint on the inflamed part. A large vessel full of cold water being then placed on a table by the bedside, one end of a broad strip of cloth should be dipped in the water, and the other end (which should be cut to a point) laid on the lint; and so the water will be carried in a constant gentle stream down the cloth to the inflamed part. When cold is not agreeable to the patient, tepid or warm applications should be substituted.

5. *To control changes in the exuded fluids.*—There are some remedies which are believed to have the power either of destroying or removing that element in the blood which is the cause of disease, or else of so acting upon the morbid effusions as to cause their dispersion and absorption. *Mercury* is the chief remedy of this class; and the popular doctrine is, that, in acute inflammation, especially of serous or parenchymatous structures, mercury causes absorption of lymph, or of the effused fluids; and that for this purpose it should be administered in repeated doses, with sufficient opium to prevent it from running off by the bowels, and that it should be continued till the mouth is affected. F. 62—67 will show the common mode of administration.

But the author does not hesitate to say that except in syphilitic inflammation of the eye, this absorbent power of mercury is grossly exaggerated; and he would advise his readers, if they still choose to produce salivation for inflammation, at all events to observe the following rules:—It should never be resorted to till after such purgatives and other eliminatives, and bleeding, local or general, as shall be deemed necessary, shall have been used. The effect should be produced by the smallest doses given continuously at regular intervals. F. 63, 64. All salivation is an unnecessary evil. In the case of children, calomel should be given in continuous doses, till it causes green, chopped-spinach-like stools.

Tartar emetic may be used either in nauseating doses, F. 68, to depress the heart's action and cause perspiration, or else in emetic doses, to purify the blood by vomit and stool and promote expectoration; or it may be combined with purgatives, of which it greatly increases the action, F. 40, or with mercury, F. 62, or lastly, as a direct antiphlogistic, after the manner invented by Marryatt, and detailed under F. 68 in the Appendix. Antimony, like bleeding, is best adapted for the early stage of inflammation, before effusion has occurred.

Stimulants, and astringent solutions, are of great service in inflammation of mucous membranes, by decomposing and washing away their irritating secretions, and inducing contraction of the capillaries.

Counter-irritants.—Blisters are the best form of counter-irritants in recent inflammation; but they should never be applied too near the seat of an acute disease, and never till its activity has been subdued by previous antiphlogistic measures.

Diet.—The diet in acute inflammation should, as a general rule, not be of a stimulating nature. But the starving system must not be indiscriminately applied to children, or the old or debilitated; or, in fact, to any patient whatever: on the contrary, the strength should be supported, and the waste of illness be mitigated throughout by mild fluid nutriment, milk, arrowroot, veal or chicken broth, &c. In most cases there comes a time when the pulse gets soft and fast; and the cheeks, or hands, or feet chilly; and when warm wine and water is of great service; or even is absolutely essential to keep up the heart's action.

Regimen.—There must be a total avoidance of everything that would irritate mind or body. Perfect rest in the recumbent posture, and in a position as easy as it can be made,—cool air,—a quiet and darkened chamber,—with mental consolation, to allay doubts and fears and inspire resignation and cheerfulness, are most potent aids to medical treatment, which without them would often be utterly fruitless.

SECTION IX.—CHRONIC INFLAMMATION.

Definition.—Inflammation is said to be chronic when it is slow in its progress, and tends to last long, or even indefinitely.

Pathology.—It consists in permanent local hyperæmia, with exudation into the interstices of the part affected, or from its surface; if that be a mucous membrane, the secretion is probably mixed with pus.

Causes.—Its causes may be local or constitutional. Thus it may in the healthiest subjects be caused by any slight and continued irritant;—

or it may be the sequel of acute inflammation. But more frequently it is the local manifestation of some constitutional disorder, such as general debility,—or over-stimulation and plethora,—or disorder of some important organ, as of the stomach, or liver, or kidney,—and consequent impurity of the blood.

Treatment.—The indications are, to remove all constitutional disorder, to allay local irritation, and to restore the tone of the distended vessels.

Constitutional Treatment.—On this part of the subject, our space forbids us to do more than make a few remarks on the most obvious forms of constitutional derangement, which accompany chronic inflammation, and on the remedies that are known by experience to be most useful as alteratives.

(1.) If the patient is bloated and plethoric, with red lips and conjunctiva, and a full hard pulse, and indulges freely in stimulating food and drink, and has unimpaired digestive organs, so that blood is constantly formed in too great abundance, the diet must be lowered and restricted chiefly to fish and vegetables; free exercise should be taken in the air; the bowels should be actively purged with calomel and black draught; and then a course of alterative medicine should be commenced in order to increase the various eliminative secretions. Mercury, given in small doses at bed-time with saline aperients in the morning, deserves to be mentioned first: Plummer's pill, in doses of gr. v. every night, is an excellent form, or F. 63, 65; taking care, however, to use the mercury in obtaining increased elimination by the liver, and not to cause salivation. Next to mercury, tartar emetic, given in very small doses, F. 68, is deserving of notice; it is highly advantageous to combine it with mercury, F. 67. Saline and alterative medicines, F. 58, 61, will also be of great service.

(2.) But if the chronic inflammation occur in an enfeebled and irritable, or scrofulous constitution, a nutritious and liberal diet must be adopted, wine, cod-liver oil, and tonics (F. 1, 2, 3, 9, &c.) should be administered in order to improve the digestion and vigour of the circulation; irritation and pain must be allayed by sedatives and opiates; and the secretions of the bowels be maintained by the gentlest laxatives.

(3.) If the complexion and eye are sallow, a few doses of calomel or blue pill, at night, or F. 63, with morning aperients, and the nitro-muriatic acid, F. 22, or dandelion, and colchicum, are indicated.

(4.) In all cases the condition of the urine should be inspected, to ascertain whether albumen or blood discs,—indications of congestion or degeneration of the kidneys,—are present. In such cases, and in all others in which the skin is dry and harsh, it should be stimulated by exercise, by warm clothing, especially flannel, by the flesh-brush or horse-hair gloves, and by an occasional ten minutes' immersion in the warm bath; 96°—98° Fah.

Local Treatment.—This has for its objects, to remove exciting causes, to unload the distended vessels, and to make them contract to their natural calibre, and to exercise the part in its proper functions, so that it may gradually resume the actions and sensations of health.

Local bleeding may be employed at intervals to unload the vessels, whilst they must be excited to contract by various stimulants and astringents; such as the sulphates of zinc, copper, and alumina, nitrate of silver, salts of mercury, &c. The application of cold by pumping, or by the douche, is often highly serviceable. These or any other measures will be known to do good if they make the part feel stronger and more comfortable, although their first application may have been painful; but if they render it hotter and permanently painful, it is a sign that they stimulate too highly, and may thus be in danger of bringing on an attack of acute inflammation.

Counter-irritants are more useful in chronic inflammation than in the acute, especially those which establish a permanent suppurative discharge.

Pressure, if gentle, equal, and continuous, is of material use in many chronic inflammations, and even in acute inflammation of the breast and testicle, when its first violence has been diminished by leeches.

SECTION X.—MODIFIED INFLAMMATION.

I. In the two sections foregoing, we have described the treatment of inflammation in general, such as may be produced in all individuals: but, as we observed at p. 31 the course and result of inflammation are altogether modified by the causes producing it, and so must the treatment be likewise; and the modifications resulting have been enumerated at p. 32, and will be found by reference to the Index. Here we may allude shortly to

II. OUTWARD CAUSES OF MODIFIED INFLAMMATION.—We also showed, at p. 31, that some of the causes of inflammation are outward, and that others reside in the patients themselves. Of the outward causes, those which interest the surgeon will be discussed in the next part of our work; in which there will be described the various modifications of inflammation ensuing on cuts, blows, gun-shot wounds, heat, cold, and poisons of various kinds.

III. INWARD CAUSES.—The inward causes consist in morbid states of the patient's blood. Under the head of scrofula and carbuncle will be noticed some of the modifications of inflammation arising in this way. It may not be out of place here to notice one or two others.

1. *Gout.*—It is out of our province to describe gout, yet, amongst the maladies commonly called surgical, are many distinctly gouty; such as severe inflammations of the eye and of the testis, severe eruptions of the skin, and irritable states of the kidneys, bladder, and urethra. The chief marks that any acute or chronic attack is of a gouty nature are, that it probably arises quite suddenly; yet that the patient, if cross-questioned, admits that he has not been quite well for some time; that possibly an aching in the great toe, or spot of psoriasis on the skin, or

that some very anomalous symptom, cough, dyspepsia, or hypochondriasis, has existed for some time, and has gone off just before some more important part has suffered. The patient is probably either too florid, and has been living too well, thus producing what the writer calls *high gout*, or, on the contrary, has been exhausted by fatigue or anxiety, thus producing what we call *low gout*. The bowels are probably torpid; the urine either very pale and copious, or scanty and full of lithates: gout probably also exists in the patient's family. The treatment of an acute attack will consist in active purgation, with calomel, colchicum, and alkaline aperients, F. 61, 71, with warm baths, low diet, and saline draughts. In a chronic attack, the more cautious use of the same means, followed by bitter infusions with alkalis, and alteratives, F. 72. Intense pain, and utter loss of function, followed by complete recovery, are characteristics of gouty inflammation.

2. *Rheumatic Inflammations.*—These, if acute, may usually be known by the intense aching aggravated by warmth, the profuse perspirations, and the tendency of the malady to shift from one tendinous or muscular part to another. If chronic, there is an obstinate aching, sometimes worse at night, sometimes relieved by the warmth of bed. For the acute, moderate purgatives and alkalis, F. 65, 70; for the chronic, warm aperients and stimulants, F. 7, 38, are indicated; and, in most sub-acute affections, the iodide of potassium, F. 94, 96.

3. There are many modified chronic inflammations difficult to describe or classify, yet easily recognised in practice, which evidently depend each on a particular blood-taint, and each of which is benefited by some special alterative. In all cases it is right to begin with *general* treatment; that is, to improve the health, to see that the bowels, kidneys, and skin do their duty, and that the diet is sufficient. Then, if general treatment does not avail, some specific remedy must be sought. First, we may mention, *iodide of potassium*, which has the power of dissolving many old deposits in rheumatic, gouty, scrofulous, and syphilitic cases, and of improving many skin eruptions, F. 94. Secondly, the *liquor potassæ*, F. 78, which, as Dr. Parkes has shown, undoubtedly causes oxidation of some blood elements. It is indicated when the urine is red, and contraindicated in most cases of mere debility. Besides these alteratives, we must mention sarsaparilla, small doses of corrosive sublimate in tincture of bark, F. 87, and arsenic, F. 97, which are also useful in certain chronic inflammations, especially of the skin. In many of these the real evil seems to be a want of vigour, through which the tissues in question seem unable to maintain their vitality. It is on this principle that mineral tonics, as arsenic, zinc, copper, and the mineral acids seem to do good, by giving a better quality to the materials assimilated.

CHAPTER VII.

EFFUSION OF SERUM AND ŒDEMA.

Effusion of Serum may be caused, 1st, by any circumstance which hinders the return of venous blood; this is called *simple œdema*. 2ndly. It may be caused by a depraved state of the blood, arising from disease of the kidneys, *renal dropsy*. 3rdly. It may be an inflammatory exudation.

In almost all cases of inflammation, effusion of serum is the earliest and most constant effect; the liquid being poured out equally into the areolar tissue—into the parenchyma of organs—from mucous and serous surfaces, and from the skin. If it is followed by any of the other effects of inflammation, it is always more widely extended than they are. But it may be the chief or only effect of inflammation, as in œdema glottidis, and the so-called acute hydrocephalus; and some subacute inflammations of the serous membranes. In patients of a lax, flabby habit of body, and in parts of loose and cellular structure, as the prepuce, eyelids, and scrotum, inflammation always produces more of this effect than in those of a firmer texture.

The serous liquid effused in consequence of inflammation is not, as Mr. Paget observes, the merely albuminous liquid which is commonly known by that name, and which is exuded in passive dropsy. but is in reality liquor sanguinis, and contains a variable quantity of fibrine; as may be readily proved by the spontaneous coagulation which takes place in the so-called serum exhaled from the skin under a blister of cantharides. It is difficult to explain why the effusion remains within the body, as it may for many days and even weeks, without the fibrine separating and becoming solid.

The so-called inflammatory serous effusion may terminate in four ways:—1st. It usually becomes quickly absorbed; an event which is hastened by such purgatives and diuretics and tonics as tend to drain the blood of impure materials, and give vigour to the circulation, and by bandages and other means of local stimulation. 2ndly. In some cases it resists absorption for a long period, or altogether; of which hydrocele, some cases of hydrothorax, hydrarthus, and hydrocephalus, afford examples. 3rdly. The fibrine may slowly separate from the serum, and solidify, causing a doughy indolent thickening of the cellular tissue, the treatment of which will be mentioned at the end of the ninth chapter. 4thly. The serum effused may distend the cellular tissue, so as to interfere with the nutrition of the skin; which may be remedied by making punctures with a needle, and allowing it to ooze gradually out. Of the manner in which serous effusion may prove fatal to life, in the œdema glottidis and hydrocephalus, it is not our purport to speak at present.

Œdema is the name given to the swelling caused by the presence of serum, whether inflammatory or dropsical, in the cellular tissue. It is a soft, inelastic, diffused swelling, which *pits on pressure*, that is, retains for a time the pit or mark made by the pressure of the finger. If œdematous limbs become inflamed from any cause, the skin is exceedingly liable to ulcerate or slough.

The causes of dropsical œdema, which most concern the surgeon, are the pressure of cancerous, aneurismal, and other tumours on the great veins of a limb, and obstruction of the veins by phlebitis. A raised position, moderate support by bandages, and punctures made with a common sewing-needle, to let the serum exude, are the most rational palliative measures.

CHAPTER VIII.

HÆMORRHAGE.

HÆMORRHAGE, like serous effusion, may be a consequence, 1stly, of inflammation or excitement; 2ndly, of obstruction to the return of venous blood; and 3rdly, of structural weakness of the blood-vessels and thinness of the blood, as in scurvy and putrid fevers. The first form is called *active*, the last two *passive*.

(1.) *Active hæmorrhage* consists in an escape of arterial blood from the capillaries, when ruptured by the distention caused by acute inflammation or violent excitement; and more or less of it doubtless occurs in every case of violent inflammation. It occurs during the formation of abscess in the cellular tissue and in the liver. But the most common seat of inflammatory hæmorrhage is mucous membrane, especially that of the lungs. The principal instances of it which fall under the surgeon's care, are epistaxis or hæmorrhage from the nose; hæmorrhois or hæmorrhage from the rectum; hæmorrhage from the urethra during gonorrhœa; and from granulating wounds. It has also been known to occur from the conjunctiva; and more rarely from the pleura, pericardium, and peritonæum. Sometimes the blood issues, not from the surface of the inflamed membrane, but from portions of adherent lymph, which have become vascular, and whose newly-formed capillaries have been over-distended and ruptured.

Diagnosis.—Inflammatory or active hæmorrhage is distinguished from that which is the result of congestion or debility, by the presence of pain, heat, and throbbing, and of a febrile state of the pulse and system generally.

Treatment.—This form of hæmorrhage is to be treated by bleeding, if it can be borne (and it may be observed that it is less debilitating to employ one full venesection, so that the cause may be at once removed, than to let the blood dribble perpetually away from the part in small quantities), and by purgatives and astringents, and opium (F. 34, 35, 75). Cold, if it can be applied, perfect rest, and an elevated position, are the local measures.

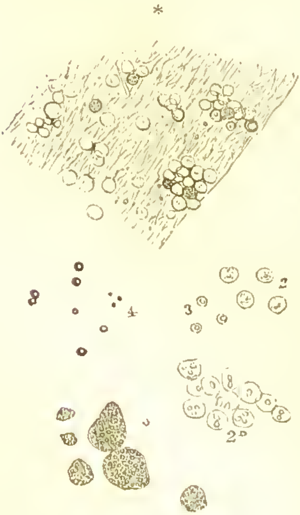
(2.) In *passive hæmorrhage* the blood which escapes is venous. The principal instances of it are hæmorrhage from the nose in old subjects with diseased liver; melæna, or hæmorrhage from the liver, and passive menorrhagia and hæmorrhois. The chief remedies are, dilute sulphuric acid, sulphate of alumina, acetate of lead, catechu, gallic acid, and other vegetable astringents which increase the coagulability of the blood, and ergot of rye, which increases the contraction of the capillaries. F. 14, 186, 187, &c.

CHAPTER IX.

EXUDATION OF FIBRINE AND ADHESION.

We have already spoken of the exudation of fibrine, as the material by which repair is effected; now we must speak of it as an effect of inflammation, by which organised adhesions or bands of false membranes are formed; cavities are filled up, membranes rendered thick opaque and rigid, and the substance of organs infiltrated with solid deposits.

The *material* is, so far as we know, the same fibrine as that which has been described under the head of repair. It may either *set* into fibres, or develop fibroplastic corpuscles: or both modes may be combined to any degree.



It may very soon become permeated by blood-vessels, which no doubt are outgrowths from the nearest capillaries. Specks of blood are often found in lymph, and it has been believed that they are new formations, and that vessels may be developed *de novo*, as in the incubating egg; but this hypothesis is not probable.

When lymph is once effused, its destination may vary according to circumstances. (1.) It may be developed into any of the tissues capable of renovation: *i. e.*, fibrous tissue, bone, or epithelium, forming bands of adhesion, cicatrices, superficial deposits, and thickened membranes.

(2.) It may undergo changes of a beneficial sort, which cause it to be rapidly absorbed; that is, if the morbid state of blood which caused the exudation be relieved, the latter may undergo fatty degeneration, and either be absorbed or remain harmless, in the state commonly known as *yellow-cheesy-tubercular*.

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* 1, Lymph, with fibrils and corpuscles; 2, Pus; 2a, Pus acted on by acetic acid; 3, Blood; 4, Oil globules; 5, Granular masses, *i. e.* plastic and other cells filled with oily and granular matter.

(3.) From a continuance of local irritation and afflux, the lymph may be compelled to soften into pus. In some cases, as of phlegmonous erysipelas, diffuse inflammation, carbuncle, and the like, the exudation is so *aplastic* and *cacoplastic* from the first as to be incapable of organisation, and so poisonous as to be unfit for absorption, and it softens only into an amorphous puriform fluid.

Examples of adhesion.—1. After wounds, in which the efforts of nature at repair have been frustrated, a certain degree of inflammation ensues, fresh lymph is exuded, and this, so soon as the inflammation abates, takes the form of *granulations*. These are composed of plastic cells, in every variety of size, shape, and development, mixed with filamentous intercellular matter. The deeper layers are, as to structure, converted into filamentous tissue, and as to chemical nature into gelatine, whilst the more superficial are still spherical and albuminous; and whilst the very surface degenerates into the creamy liquid called pus, which will be described in the next chapter. This is the mode in which open wounds (or wounds which the skin will not cover) generally heal in the human subject; but it is an imperfect mode; because granulations are extremely liable to be diseased, because they entail a great waste of material which escapes in the form of pus, and because the scar is always larger than in the case of a wound healing by the primary reparative process. When two surfaces covered with granulations are made to unite, the union is said to be by *secondary adhesion* or by the *second intention*.

2. A second example is furnished by the acute inflammation of serous membranes; as pleurisy, in which lymph effused under inflammation forms the adhesions which so commonly bind the lungs to the inside of the ribs. Under rheumatic inflammation, the heart may be glued to the pericardium; in syphilitic iritis the anterior chamber of the eye may be filled with lymph. After injuries, the adhesive tendency of inflammations of the pleura and peritonæum are of service in preventing the spread of exudation or of extravasated matter.

Mucous membranes, as we said at p. 32, are not commonly considered liable to adhesive inflammation, because the lymph effused is generally cast off, and does not become adherent or organised. But if two abraded and inflamed mucous surfaces are placed in apposition and left undisturbed, they may adhere;—as sometimes happens in the vaginæ of female children;—in the os uteri and Fallopian tubes of prostitutes, and in the ureters and biliary ducts when abraded by the passage of calculi; and Mr. Hancock has shown the existence of organised lymph in the canal of the urethra, in cases of stricture.

3. When a natural reparative process has failed, the surgeon often excites adhesive inflammation, in order that the lymph exuded may serve as the basis for another effort at repair. (See False Joint.) It is sometimes excited, likewise, in order that the tissue of a tumour may be starved and atrophied.

4. Separation of fibrine may take place within the vessels as well as into the tissues.

Granulations, if healthy, and proceeding towards a cure, are small, pointed, and florid; they bleed if wiped, and are not very tender. But they are subject to many disorders; being sometimes pale, bloated, and œdematous; sometimes degenerating into a pseudo-mucous membrane; sometimes breaking up suddenly, and being dissolved into a sanious fluid. When, however, the case proceeds favourably, the undermost are developed into fibro-cellular tissue, those on the surface form themselves into cuticle, and so the wound is healed.

Cicatrization.—This process of healing, or cicatrization, is attended with an absorption of inflammatory effusion in the vicinity of the wound, and a contraction of its margin, so that the wound becomes much smaller before any new cuticle is formed. Its edge then begins to look smooth and bluish, and a thin pellicle of new cuticle gradually spreads from the edge in a converging circle till the wound is closed. The material that closes up the gap is called a cicatrix: it is a band of fibrous tissue covered with cuticle. It has no thickness, for granulations do not really *fill up* gaps, as is sometimes said, and seldom form a layer more than ⅓rd inch thick; and in the case of an extensive gap the cicatrix is closely glued to the bone or fascia beneath. It afterwards shrinks, becoming paler and likewise looser, through atrophy of the deeper portions.

Lymph, whether reparative or inflammatory, may become the seat of hæmorrhage, œdema, inflammation, tubercular deposit, and many other diseased conditions.

ADHESIONS AND CICATRICES are extremely liable to shrink, and become atrophied. Thus, the extensive cicatrices left after severe burns always contract greatly; and adhesions between serous surfaces may, in the course of time, disappear entirely. After the liver or kidney has been infiltrated with fibrinous effusion the whole organ is liable to waste. During certain states of constitutional cachexy (as the scurvy), old fractures have become disunited, and old cicatrices have broken out afresh into wounds; showing that the new tissue has less vitality than that of original formation.*

Treatment.—If it be wished to remove adhesions, or thickening, the results of previous acute or existing chronic inflammation, the general rules must be attended to which were laid down for the treatment of chronic inflammation. *Mercury* has a reputation for removing induration: but, as we have before said, it should be used as an eliminative, and not to accumulate and cause ptyalism. The local means that may be used to remove the thickening left by a quite subdued inflammation of any external part, are friction, stimulating liniments, F. 143, 150; ointments containing iodine, or mercury; gentle exercise; shampooing; pressure by bandages or otherwise; cold affusion; electricity and galvanism; discutient lotions, especially those of zinc, F. 117, or muriate of ammonia, F. 118; blisters, or other counter-irritants—always taking care not to produce active inflammation by too violent stimulation.

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* In examining the body of a madman who had stabbed himself in the abdomen fifteen different times during his life, the parts near the *most recent* wounds were found united by considerable false membranes;—at the situation of some that were older, there were only a few thin cellular adhesions; whilst at the oldest, there was no trace of adhesion or false membrane whatever. Andral, Anat. Path. vol. i. p. 486.

CHAPTER X.

SUPPURATION AND ABSCESS.

SECTION I.—SUPPURATION AND ANALOGOUS PROCESSES.

SUPPURATION.—According to the doctrines stated in the preceding chapters, whenever effusion of fibrine is attended with a continuance of acute inflammation, or when there are certain defects in the composition of the blood, the fibrine softens down, and with the cells, which have undergone certain changes, becomes a creamy liquid called *pus*.

1st. *In Abscesses.*—When suppuration takes place in any cavity, or in the substance of the areolar tissue, or of any organ, an *abscess* is said to be formed. If the inflammation is of the variety called healthy or sthenic, and circumscribed, the centre only of the effused fibrine will probably soften; the circumference will form a cyst, containing the liquid. If the inflammation is low, or unhealthy, as in erysipelas and pyæmia, the whole of the fibrine will probably soften into a *puriform fluid*, to be presently described, and the abscess will be diffused.

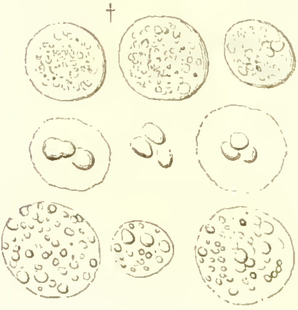
2nd. *In open granulating wounds.*—In the case of wounds and other injuries, in which a portion of the tissues is left uncovered by skin, or of wounds, which have not united by adhesion, the exposed surfaces, after bleeding has ceased, and a thin reddish serum has ceased to exude, become glazed over with a grayish or buffy coat composed of fibrine and the white corpuscles of the blood. Two or three days pass, more or less; and the vicinity of the wound displays evidence of slight inflammation, and lymph is effused in thin layers. Of each layer a portion soon becomes vascular, and its surface is thrown up into little eminences called granulations, which secrete a fresh layer; another portion degenerates into pus, forming a bland creamy covering for the granulating surface.

Physiological relations of Suppuration.—1st. Suppuration is essentially a morbid process; yet as it may accompany other processes which tend to a beneficial end (such as granulation), so it is customary to speak of it when accompanying such beneficial processes, as *healthy*, and to describe the product as *healthy pus*. Moreover, though suppuration be a morbid process, it often takes the place of other processes infinitely more morbid. Thus, after a very severe lacerated wound, when the patient has passed through several days of fearful constitutional excitement; or after sloughing or rapid phagedænic ulceration, nothing delights the surgeon more than the sight of healthy pus, because he knows that it announces at least an attempt at reparation, and the cessation of violent febrile excitement. 2ndly. The formation of abscesses often seems to serve as a means for eliminating some noxious matter from the blood. 3rdly. Suppuration affords a mechanical means of removing foreign substances impacted in the soft parts. *Lastly*, if too profuse, it may exhaust the vital powers, and bring on hectic fever.

Healthy Pus.—Pus is a yellowish-white, opaque fluid, of the consistence of cream: free from smell, neither acid nor alkaline, said to have a sweetish, mawkish taste, insoluble in water, although freely miscible with it, and very slow to putrefy. It consists of a thin serum, holding a vast number of globules in suspension. Its usual specific gravity is 1·021—1·040; heat coagulates the albuminous elements of its serum; potass and ammonia convert it into a gelatinous mass.

The most recent analyses* show that pus contains water (86·1 per cent.), fat, extractive, and albumen. It also contains about 0·8 per cent. of salts; chiefly common salt, and muriate of ammonia.

Pus Globules.—When these are examined under the microscope, they are found to be opaque spherical globules, apparently granulated like mulberries, but in reality smooth, as may be known by examining their circumference. They measure from 1-5000th to 1-2000th of an inch in diameter; some even are larger. They may be shown to consist of cell membrane, containing nuclei, oil globules, and minute granules. If water be added, they imbibe some of it, and become larger, more transparent, and less granular. If acetic acid be added, it brings clearly into view two, three, or four nuclei; and renders the other parts transparent, or so invisible, that they seem to have dissolved. These central nuclei furnish the best means of distinguishing pus from other globules. Besides the globules, other smaller molecules are also found in pus in great abundance.



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* Vide Mayo, Med. Gaz., 19th Oct. 1839; Vogel, über Eiter und Eiterung, p. 35; Davy, op. cit. vol. ii., p. 468; Bonnet, Med. Gaz. vol. xxi.; Gueterbock, de Pure et Granulatione, Berol., 1837.

† The uppermost group gives a pretty accurate idea of the appearance of pus globules magnified 400 diameters. The middle figures represent globules treated with acetic acid;—the lowest represent the appearances when pus is partially decomposed or treated with liq. potassæ. These figures were drawn from nature by Dr. Westmacott, under the superintendence of Dr. Johnson of King's College.

Mucous Pus or Muco-purulent matter.—Mucus consists of a viscid matter coagulable by acetic acid and containing epithelium. The mucus yielded by every distinct organ differs in the shape and character of the epithelium contained in it; for example, mucus from the bladder is very different from mucus from the bronchi. Under inflammation, mucus may be mixed with albuminous or fibrinous exudation, and with pus, in any proportion. The real nature of any such matter is easily decided by the microscope. But the question of the *diagnosis between pus and mucus* is not of the same consequence now as it was at the time when pus was supposed to indicate the existence of an ulcer. Muco-purulent matter *is pus* mixed with mucus.

PURIFORM FLUID is, as we have said, a fluid formed by the softening down of a fibrinous exudation, without the development of real pus globules. It constitutes the liquid yielded by carbuncles and unhealthy abscesses, by spreading ulcers, and by the fibrinous exudations which occur in the lungs and elsewhere, when putrid fluids have found their way into the blood. It exhibits oil globules, shreds and fragments of tissue, granules, and possibly abortive cell formations; smaller than pus globules, less regular, and not giving the characteristic reaction with acetic acid. See *Pyæmia.*

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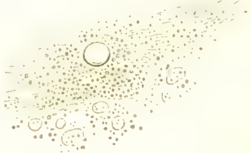

SOFTENING is a process analogous to suppuration, inasmuch as it is a degeneration and liquefaction of the affected tissue, and of any fibrinous exudation with which it may have been infiltrated, although without the presence of true pus. It is a condition met with in the brain, either from disease of the arteries, or from a low degree of inflammation. Amongst the products of decayed exudations are the bodies known as *compound granular cells.* They were formerly called *exudation corpuscles,* because they were found in inflammatory exudations; but they are by no means peculiar to these; on the contrary, they seem to be formed by a process of fatty degeneration of almost every primary cell, and thus may be found in any cell-growth, healthy or morbid. For instance, they may be found in the colostrum or milk first secreted after parturition; in the decidua; and in enchondromatous, fibro-plastic, cancerous, and almost every other morbid growth. They are unaltered by water and acetic acid; potass dissolves the cell-wall, and sets free the granules.‡ In some cases these bodies consist merely of an aggregation of fatty molecules.

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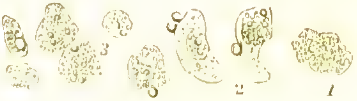

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* This cut represents puriform fluid from a softened lymphatic gland.

† 1, shows a cell from a fibro-plastic tumour; 2, from cancer; 3, from an ovarian cyst, and from the decidua,—all loaded with oil-globules: traced by the author from actual specimens, by the camera.

‡ Hughes Bennett on Cancer, &c., p. 153.

SECTION II.—ACUTE ABSCESS.

SYMPTOMS.—Acute abscess (which, when occurring in the subcutaneous cellular tissue is called *phlegmon,*) commences with the ordinary signs of acute inflammation—namely, inflammatory fever; severe throbbing pain; bright redness; and much swelling;—firm in the centre, and œdematous around. The occurrence of *suppuration is indicated* by an abatement of the fever, and a change in the pain,—which is less acute, and converted into a sense of weight and tension. Then the tumour becomes softer, and loses its bright arterial colour; and as the quantity of pus increases, its centre begins to *point,* that is, to project in a pyramidal form, and *fluctuation* can be felt by alternate pressure with the fingers. After this, the parts between the abscess and the surface become successively softened and disintegrated. The tumour becomes more and more prominent; the centre exhibits a dusky-red or bluish tint, the cutis ulcerates, the cuticle bursts, and the pus escapes.

Deep Suppuration.—But where pus is formed under fasciæ, or deep in the mamma, or pelvis, and cannot quickly make its way to the surface, the pain is not relieved but often much aggravated by the increase of distention, and the constitutional symptoms are much more severe. See HECTIC.

Although abscesses may burst into serous cavities, or mucous canals if they happen to be near, still their general course is that which is least prejudicial; namely, towards the skin.

CAUSES.—Acute abscess is mostly *idiopathic,* that is, depends on a disordered condition of the blood, and is a frequent sequel of fevers;—it may, however, be caused by blows, ecchymoses, or by foreign bodies introduced into the skin or flesh.

TREATMENT.—In a case of idiopathic abscess the indication always is to remove, if possible, the morbid state of constitution on which it depends, by purgatives, and to hasten the process of suppuration by warm poultices. In abscesses arising from local injury, all exciting causes, such as thorns, splinters, &c., should be removed.

Poultices relax the skin, promote perspiration, soothe pain, encourage the formation of pus, and expedite its progress to the surface. They should be large, soft, and light, and may be made of bread and water, or linseed meal, or of camomile flowers boiled till they are soft, or of bran sewed up in a flannel bag, which may be dipped into boiling water as often as it becomes cold (F. 152), &c.

The *warm-water dressing*—that is, a piece of soft lint, or folded linen dipped in warm water and covered with oiled silk to prevent evaporation, and the *spongio-piline*—are good substitutes for poultices in many cases, especially for irritable sores; but when there is much pain, they are not so soothing as the large soft warm mass of a well-made poultice.

Respecting the *opening of abscesses,* it may be laid down as a general rule, that if they point and become pyramidal, without enlarging in circumference, they *may* be left to burst of themselves; but that if they enlarge in breadth and circumference, without tending to the surface, they should be opened. In the following six cases, however, the surgeon's aid is imperatively demanded:

1. When matter forms beneath fasciæ and other dense ligamentous textures, such as the sheaths of tendons. Because these parts are dense, and ulcerate with difficulty, the pus, instead of coming to the surface, will burrow amongst muscles and tendons, extending the abscess to great distances;—producing extreme pain and constitutional disturbance, by its tension of the fasciæ which cover it, and pressure on the parts beneath,—causing risk of extensive sloughing, and impairing the future motions of the part. Hence, as a general rule, all abscesses beneath fasciæ, or among tendons, or under the thick cuticle of the fingers, should be freely opened, as soon as the existence of matter is suspected.

2. When abscess is caused by the extravasation of urine, or other irritant fluids; or when it contains an unhealthy matter, which might diffuse itself and spread the disease: as in carbuncle.

3. When an abscess is formed in loose cellular tissue (as around the anus), which would readily admit of great distention and enlargement of the sac, and more especially if the cellular tissue is partially covered with muscles (as in the axilla), under which the matter might burrow.

4. In suppuration near a joint; or in the parietes of the chest or abdomen; or under the deep fascia of the neck; lest the abscess burst into the serous cavities, or the trachea; or cause compression of, or burst into, the trachea, œsophagus, or jugular veins.

5. In suppuration of very sensitive organs, as the testis.

6. When it is desirable to avoid the scar which always will ensue when an abscess ulcerates spontaneously.

And in the first three of these cases it is much better to make an opening before matter has formed, than to delay it for one moment afterwards.

Abscesses may be punctured with a large lancet, used as in venesection, or with the sickle-shaped bistoury, commonly called *Syme's*; or, if deep and extensive, by a straight-pointed, double-edged bistoury. Holding it like a pen, the surgeon should gently plunge it in at a right angle to the surface, till it has entered the cavity, which may be known by a diminution of the feeling of resistance, or by gently turning the instrument on its long axis, so that a drop of pus may well up by its side. Then the aperture may be enlarged sufficiently as the instrument is being withdrawn. The puncture should be made either at the most depending part of the abscess, or else where the matter points most decidedly and the skin is the thinnest; and a very fine strip of oiled lint (called a *tent*) may be gently introduced between the edges of the opening, and be allowed to remain for the first forty-eight hours to prevent them from closing again. No rude attempts should be made to squeeze out matter; but it should be allowed gradually to exude into a poultice or fomentation.

The poultice may be continued till all the pain has subsided, and the cavity has begun to granulate; but not too long, lest the granulations become weak and flabby. And then the best plan is to apply a compress of linen, and a bandage. If the cavity does not contract speedily, it must be treated as a *weak ulcer* or *fistula*. If the suppuration continues profuse, tonics, change of air, and a good diet are advisable, in order to prevent hectic, and enable the constitution to repair the local mischief.

Absorption of Pus.—It occasionally happens that acute abscesses are cured by the absorption of their pus. This is likely to happen when, after acute inflammation, the matter remains without tending to come to the surface, and without pain: the means best adapted to promote it are moderate pressure, purgatives, and tonics.

By these means, in fortunate instances, the liquor puris may be absorbed, the pus corpuscles undergo degeneration and disintegration, and after remaining for some time as a fatty or cheesy mass, may pass again, in a molecular form, into the blood-vessels.

SECTION III.—HECTIC OR SUPPURATIVE FEVER.

DEFINITION.—Hectic (a Greek word signifying *habitual*) fever is a remittent fever, marked by daily paroxysms. It depends on a disordered state of the blood, whether from obstinate malassimilation, or from severe local disease with suppuration.

SYMPTOMS.—The patient generally displays great loss of flesh and strength, the skin is muddy, and the eyes hollow. Usually every afternoon or evening he has a fit of shivering, more or less sever followed by heat and thirst, which render the early part of the night restless; then sleep and profuse sour perspiration come on. The tongue is red, and there is a marked tendency to diarrhœa. The pulse above 80 and soft.

If the hectic arise from a local disease, it may cease instantly, on the removal of the disease, by operation or otherwise. But if the causes continue, and the malady increase, the diarrhœa and perspirations become more and more profuse and exhausting, and the patient sinks.

CAUSES.—Hectic fever, more or less well marked, attends several of the great assimilative disorders of the blood, as diabetes. But that which interests the surgeon is its connection with suppuration; and there is no doubt that true severe hectic depends on the absorption of decomposing pus into the blood, and that the perspirations and diarrhœa are the means by which nature eliminates the poison.

In the case of certain deep abscesses (the writer, from his midwifery practice, has seen it in the breast more often than elsewhere) there may be a daily attack of cold shivers, succeeded by heat and profuse fetid perspiration, and attended by great debility, red tongue, and diarrhœa; and these symptoms, after lasting for days, may be relieved at once by opening the abscess.

It is often said that shivering is a sign of suppuration. This is not true absolutely, for pus may be formed without shivering. But shivering is a sign that matter, if formed, is beginning to be absorbed in a condition which renders it poisonous; and the occurrence of it, especially if attended with the other signs of hectic, renders it the surgeon's duty to look for local mischief.

TREATMENT.—The first indication is to remove the local disease if it can be done. The second is to support the strength. The third to treat symptoms.

The first may often be fulfilled by letting out pus, or cutting out a diseased part, or such other operation as may suit the individual case.

The second, by abundance of food, especially animal food, and good beer or port wine. Preparations of isinglass, or other fish or animal jelly, seem also to supply waste; and there are some cases in which feverishness is so great that the patient can take only milk and farinaceous food, as arrowroot, bread, &c.

The best tonics are bark and steel, especially the decoction of bark with nitric acid, F. 1: and the *Mixture* of Moses Griffith, F. 19.

Diarrhœa is best combated by pure meat diet and sulphuric acid, F. 24, 25; with small doses of opium. Sometimes the old-fashioned soothing medicines, chalk and bismuth mixtures, &c., are useful, and sometimes gallic acid. Perspirations are relieved, also, by sulphuric acid, and oxide of zinc.

SECTION IV.—CHRONIC ABSCESS AND TYPHOID SYMPTOMS FROM PUTREFACTION OF PUS.

GENERAL DESCRIPTION.—Chronic abscesses may be the result of an exudation produced by a low and unsuspected degree of inflammation, or of some non-inflammatory scrofulous deposit. They most frequently are the result of diseased bone. They are mostly lined with a thin, reddish-gray, distinctly-organised cyst;—there is little or no vascularity in the parts adjoining;—and the pus usually is thin and flaky.

SYMPTOMS.—When first detected, a chronic abscess appears as an obscure tumour, with a fluctuation more or less distinct according to its distance from the surface. It is free from pain, tenderness, swelling, and redness, unless far advanced, or accidentally inflamed.

PROGRESS.—These abscesses may attain an enormous magnitude, before the coverings ulcerate. When, however, from the increasing distention, or from some accidental irritation, this does happen, the skin reddens, inflames, and ulcerates, and so the matter is discharged.

TERMINATIONS.—(1.) In slight cases the interior of the sac pours out granulations;—the reddened skin around the orifice ulcerates;—and the sore so formed may heal. (2.) If the restorative powers are weak, or the abscess is caused by a piece of diseased bone or some other source of irritation which is not removed, one or more *sinuses* may remain. (3.) If, on the other hand, the abscess is very large, or if, after the admission of air, the pus have not a free exit, a most serious train of consequences will ensue. The pus, exposed to the atmosphere, putrefies,—the hydrosulphate of ammonia (the product of putrefaction) is absorbed into the blood,*—and a train of typhoid symptoms comes on precisely like those which were produced by the air of a cesspool in Dr. T. H. Barker's experiments. There is hot and dry skin; dry and glazed tongue; parched lips; the formation of healthy pus ceases; the pulse is rapid and jerking; there is low muttering delirium, and picking of the bedclothes, and jerking of the muscles of the arms and legs (*subsultus tendinum*); the bowels are paralysed and tympanitic, or else probably there is offensive diarrhœa, and the patient, if unrelieved, sinks comatose.

PROGNOSIS.—Hence, the danger of these abscesses will be great, if the sac has attained a large size, and has advanced so far towards ulceration that a spontaneous and permanent aperture is inevitable, more especially if it is connected with diseased hip or vertebræ, which will keep up the secretion of pus.

TREATMENT.—There are three *indications:* (1.) To amend the general health by the means detailed in the Chapters on Chronic Inflammation and Scrofula. If (as in the case of psoas and lumbar abscess) the abscess has been caused by some local disease, the latter must, if possible, be ascertained and removed by proper measures.

(2.) To procure absorption of the matter, if possible. This may sometimes be effected by stimulants, in cases not arising from diseased bone, applied to the tumour; or pressure; as the Emp. Ammoniaci cum Hydrarg.; or F. 160.

(3.) But if the tumour continues to enlarge it cannot be opened too soon;—especially if there is any incipient redness of the skin. And a different proceeding is requisite in different cases.

If the abscess is superficial and small, a sufficient opening should be made with a lancet to let out the raspberry-cream-looking matter and the flakes of lymph floating in it; and some strips of adhesive plaster should be passed round the part, so as to keep the sides of the sac in apposition with a moderate degree of pressure. Thus, a free exit being provided for the pus, the opposing surfaces of the cavity will often granulate and adhere; then the external aperture heals, and the case is cured. If this adhesion does not take place, stimulating injections may be used, such as F. 117, diluted;—or the cavity may be slit up, and made to heal from the bottom.

Large Chronic Abscesses.—If the abscess is so large that the exposure of its cavity would lead to the evil consequences that have been enumerated, or if it is connected with disease of the spine or other bone (as in the case of psoas abscess), the surgeon must take care not to let air into the sac; nor to empty the sac suddenly and leave its sides unsupported; else when the fluid pressure within is removed, blood will very probably ooze from the delicate vessels, and give more material for putrefaction. A *small puncture* should be made at the most depending part of the tumour. Mr. Vincent recommends a trocar. As much matter as flows spontaneously should be permitted to escape, the parietes of the abscess should be brought together by careful bandaging, and then the puncture should be carefully closed by *collodion* or plaster, and the patient be kept at rest till it is healed. During the flow of the matter, the greatest care ought to be taken to prevent the admission of air into the sac. At the expiration of ten days or a fortnight, when it is nearly refilled, a second puncture should be made (but not too near the former), and should be healed again in like manner. This operation should be repeated at proper intervals, taking care never to let the abscess become so distended as it was before the previous puncture,—and using *moderate* support by bandages in the intervals. Thus, in fortunate cases, these repeated partial evacuations, combined with proper constitutional measures, will cause the abscess gradually to contract;—so that it either becomes completely obliterated or degenerates into an insignificant fistula.*

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* It may be detected in the blood and urine. The blood in these cases is black, and refuses to coagulate;—which is precisely the effect produced by adding the hydrosulphate of ammonia to healthy blood. Vide M. Bonnet's Papers in the Med. Gaz. vol. xxi.; Dr. T. H. Barker on Sewer Exhalations; and Richardson on the Blood, Appendix I., 1858.

Perhaps a still safer method is to pass a long narrow knife through the skin, at a little distance from the abscess; then under the skin into the sac, so that the pus may pass through a subcutaneous canal, that shall be thoroughly valvular and exclude the air.†

But if air have gained admission into the cavity of the abscess, and the pus have become putrid, and prostration of strength and dry brown tongue show its influence on the system, then the indications plainly are, to make free openings and counter-openings, so as to prevent all lodgment of the putrid pus; and to wash out the sac occasionally with injections of warm water, containing a very little of the solution of chloride of soda. At the same time the strength must be supported, and the evil influence on the blood neutralised by wine, soup, bark, and the nitro-muriatic or sulphuric acid, F. 1, 22, 25.

CHAPTER XI.

ERYSIPELAS, DIFFUSE INFLAMMATION OF THE CELLULAR TISSUE, AND PYÆMIA.

SECTION I.—PATHOLOGY OF ERYSIPELATOUS INFLAMMATION.

ERYSIPELAS is an unhealthy inflammation, which, wherever situated, exhibits the following characters:—It has a disposition to spread widely along the surface of skin or membranes, or in the areolar tissue. The lymph which is secreted is incapable of organisation, and has no disposition to form a *sac*, within which the pus shall be confined; on the contrary, it is liable to universal softening, and the exudations are diffused widely, and thus extend the disease into sound parts. Erysipelatous inflammation is liable to attack different parts, sometimes simultaneously, sometimes by *metastasis;* that is, leaving one part and flying to another, thus giving evidence of its origin in a vitiated state of the blood. The different varieties of erysipelatous disease prevail epidemically together. Thus Dr. Ferguson tells us, that erysipelas and puerperal fever were generally coexistent in his lying-in hospital, the mothers perishing of one and the infants of the other. These diseases are capable of direct propagation by *infection, i. e.*, through the medium of gaseous emanations, and by contagion. Instances are now common enough, showing that the contagion of erysipelas may cause puerperal fever, just as inoculation with the fluids of a female who has died of puerperal fever is a most fatal source of diffuse cellular inflammation to the dissector.[*]

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* William Fergusson's Practical Surgery, 3rd ed. p. 92; and Lancet, Nov. 6, 1841.

† W. Adams, Subcutaneous Surgery, p. 48. Lond. 1857.

The diseases which are grouped together under the term erysipelatous, are the simple and phlegmonous erysipelas, the diffuse inflammation of the cellular tissue, puerperal fever, *pyæmia;*—which, from its often following injuries of the veins, was formerly confounded with *phlebitis*—and hospital gangrene.

The causes are, 1st, some morbid state of blood generated in the system itself, through the combined influence of disordered secretions and atmospheric influences. This is probably the cause of the milder isolated non-contagious cases of erysipelas. 2nd, the miasmata to which Dr. Gregory assigned the term *ochletic* (from ὄχλος, a crowd), and which are generated out of the effluvia of the skin and breath when many persons are crowded together, especially in hospitals. 3rd, the blood and secretions of persons already affected with these diseases; or putrid matter of any sort introduced into the blood, especially through wounded veins.

The *modus operandi* of these causes cannot be doubted; they are *zymotic:* that is, they act like ferments on the blood, and communicate to it a disposition to undergo the same changes in composition which they are themselves undergoing. The blood so poisoned deposits in the affected parts of the body an unhealthy plasma, which causes wide-spreading irritation and exudation.

Since hospitals are frequently rather a curse than a blessing through the mortality arising from erysipelatous diseases, contracted within their walls, or carried into the lying-in chamber, no pains should be spared to obviate the causes, and to prevent the extension of these diseases. Hospitals should have rooms in which the convalescents should be during the day. The floors should be dry-rubbed and polished, not washed. The walls and ceilings should be whitewashed at regular short intervals. Ventilation should be constantly watched; a space of at least 1500 cubic feet be allowed for each patient in a ward. The feather beds and mattresses should be baked, and the bedsteads be taken to pieces and exposed to the air at least once a year. No patient should be put into a bed just quitted by another. The patients should be obliged, when practicable, to use the warm bath and soap, and when not able to do so their feet should be washed often. On the outbreak of the disease, all the inmates who can be moved should be sent away, the infected ward be shut up, and the erysipelatous patients put into separate small rooms. Surgeons and pupils should not come to the bedside, especially *to a midwifery case*, immediately from the dead-house or dissecting-room, still less from a case of erysipelatous disease. The dressings and bandages used in any case should be destroyed, and tow, which may be destroyed when once used, should be substituted for sponge, which would be used again and again. Moreover, in the case of fœtid and profusely-suppurating wounds, it would be far better for the patient so affected, and for the others likewise, that he should be put into a hut, or tent, or cottage, than be allowed to remain in a crowded ward. Bags filled with charred sawdust, or any other form of charcoal, should be placed so as to absorb all putrid vapours; and Condy's, or Burnett's or Macdougal's disinfectant, or the chloride of lime, should be used liberally.

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[*] See Robert Ferguson on Puerperal Fever, p. 29; Storrs, of Doncaster, who first clearly proved the common origin of these and other septic diseases, in the Prov. Med. Jour., 23rd April, 1842; Nunnely on Erysipelas, Lond. 1841; Dr. G. Gregory on *Ochlesis*, Lancet for July 15, 1848; Routh on the Puerperal Fever of Vienna, Med. Chir. Trans. vol. xxxii.

SECTION II.—THE CUTANEOUS AND CELLULO-CUTANEOUS ERYSIPELAS.

DEFINITION.—Diffused inflammation of the skin, or skin and cellular tissue, with a tendency to spread.

SYMPTOMS.—The *cutaneous* or *simple* erysipelas is known by redness of the skin, which *disappears momentarily on pressure*;—considerable puffy swelling from serous effusion into the cellular tissue;—and severe stinging, burning, or smarting pain. The redness is generally of a vivid scarlet hue; but it will be faint and yellowish if the disease is attended with much debility, or if it affect the eyelids, scrotum, or other loose cellular parts, where it always produces a good deal of serous effusion.

In the *cellulo-cutaneous* or *phlegmonous* erysipelas the redness is deeper, and sometimes dusky or purple, and it is *scarcely*, if at all, *dispelled by pressure*;—the swelling is much greater, and is hard, brawny, and tense;—and the pain is not only burning, but throbbing.

Constitutional symptoms.—Both varieties are ushered in with shivering, headache, pain in the back, nausea, and bilious vomiting; and both are attended with fever, which will vary in its type according to circumstances. It may be of a sthenic inflammatory character, if the disease affect a young robust countryman: but it soon assumes a low typhoid character if the patient is old and weak; or if the disease were contracted in some close, foul, ill-ventilated hospital, or if a large portion of cellular tissue has begun to slough.

TERMINATIONS.—The *cutaneous* erysipelas may terminate, 1, in resolution, leaving nothing but desquamation of the cuticle with slight œdema; 2, but more frequently it produces large *bullæ* or vesicles from effusion of serum under the cuticle;—and these dry into scabs, which peel off, and leave the cutis either healed, or superficially ulcerated. 3. Sometimes, however, it is followed by small abscesses. The ordinary duration is from seven to fourteen days.

Before its termination, however, this variety of erysipelas sometimes assumes a lingering erratic character, wandering progressively along the skin, and spreading in one direction as it fades in another. Sometimes it disappears entirely from one part, and flies by *metastasis* to a distant one; and sometimes it quits the skin suddenly, and some internal organ is affected with an inflammation having the same constitutional characters.

The *phlegmonous* or *cellulo-cutaneous* erysipelas *may* terminate as favourably as the simple variety;—but it more generally leads to unhealthy suppuration and sloughing of the cellular tissue;—in which case the swelling becomes flaccid and *quaggy*;—patches of the skin become purple, and covered with livid vesications, and these patches slough, giving exit to a thin sanious pus, and to flakes of disorganised cellular tissue. And not only the subcutaneous, but the intermuscular tissue and fasciæ may slough, rendering the limb useless, even if the patient escape with his life. Moreover, after a very severe attack of erysipelas, the cellular tissue is apt to be left in a hardened, brawny state, through infiltration with lymph.

PROGNOSIS.—This must be guarded if the patient is old, enfeebled, and habitually intemperate;—if the fever is of a low cast; if the malady is situated on the head or throat, and there is coma or great dyspnœa;—or if the erysipelas is of the phlegmonous variety, and a large portion of the cellular tissue and skin is on the point of sloughing. The return of suppuration in ulcers, and the formation of abscesses, are most favourable signs.

Local Varieties.—Erysipelas usually attacks any part of the body which is injured or wounded; and in new-born children the vicinity of the navel; but where there is no external injury it usually manifests itself on the forehead: whence it may spread to the scalp, throat, and trunk. Erysipelas of the scalp is apt to be complicated with headache and delirium in the early, and coma in the later stages; and erysipelas of the throat with great dyspnœa.

TREATMENT.—The indications for the *constitutional* treatment are, to purify the blood and to support the strength;—and for the *local* treatment, to allay irritation—to arrest the extension of the disease—and to give free exit to sloughs and discharge.

Emetics and Purgatives.—It is always necessary to begin with what Dr. Todd calls eliminative treatment; that is, to produce a full and copious discharge of all the excretions, by which the blood is naturally purified. On the first occurrence of the symptoms an emetic should be given (F. 98), and be followed by five grains of calomel, and by purgative draughts, every six or eight hours, as long as they bring away hardened lumps, or dark offensive liquid motions. (F. 33, 34.)

Antiphlogistic Measures.—*Bleeding* is said to be required if the patient is young and vigorous, the pulse full and strong, the face flushed, and delirium violent; and if the inflamed part is full, tense, and vividly red, and especially if seated on the head or throat; but in most cases, a small dose of mercury at night, F. 63; with very gentle aperients and carbonate or citrate of ammonia, F. 58, will suffice, after a good preliminary purging by calomel. The practice of bleeding in zymotic disease belongs to a past generation.

Diet.—During the whole course of the disease, the patient should have a good quantity of nourishment; beef-tea, soda-water and milk; barley-water with lemon-juice, and port wine or brandy *ad libitum*, in proportion to the failure of pulse.

Tonics.—*Bark* should be given in *all* cases as soon as the tongue becomes clean and the skin moist; but it should be resorted to without delay if the pulse is soft, tremulous, or very rapid, the heat moderate, and the delirium low and muttering, or if suppuration or sloughing have commenced, F. 1.

Opium may be given in full doses at bed-time in the later stages, to allay restlessness, provided there is no cerebral congestion nor coma.

If there is great irritation of the stomach, with sickness or diarrhœa, small repeated doses of hydr. c. cretâ et pulv. ipec. c. should be given with effervescing draughts, F. 64, 58.

LOCAL MEASURES.—*Leeches* are useful when the pulse is good, and the redness vivid, and the part throbbing violently. *Minute punctures* about one-fifth of an inch deep, made with the point of a lancet, may be used as substitutes; and often permit the discharge of considerable quantities of blood and serum. *Cold lotions may* be used under similar circumstances. But *warm* or *tepid* poppy fomentations will generally be found more soothing, and theoretically are safer than cold applications.—*Flour*, dusted on the inflamed part, or soft carded cotton wool, is often very soothing in simple erysipelas.—*Pressure* by bandages is serviceable in the latter stages of most cases;—and from the very first, if the inflammation be atonic and œdematous.—*Stimulants.* Painting the surface with solution of *nitrate of silver*, or *blisters*, are of great use in creating a healthy exudation, and so putting a stop to tedious erratic cases of simple erysipelas, after proper constitutional remedies have been used. In similar cases, the *extension of the disease may sometimes be arrested* by applying the nitrate of silver so as completely to encircle the inflamed part. When there is a tendency to sinking, with diminution or disappearance of the external inflammation, warm cloths, moistened with turpentine or sp. camp. may be applied externally, whilst diffusive stimulants are administered internally.

Incisions are, to use a French expression, the *heroic* remedy in phlegmonous erysipelas. When the swelling is great, and increases rapidly;—when it is hard, tense, and resisting, not soft and œdematous as in simple erysipelas;—when the pain is severe and throbbing;—when there is the least sensation of fluctuation or *quagginess;* or when the skin is becoming livid or dusky, or covered with livid vesicles, they are imperatively demanded. They are absolutely necessary for the discharge of pus and sloughs;—for, as James observes, these matters are neither brought to the surface by pointing, nor walled in by adhesion. And they are not merely apertures for the discharge of matter, but a very effectual means of cutting short the inflammation, by relieving the tension, and by emptying the distended blood-vessels. They are also requisite in erysipelas of the throat, when great swelling threatens suffocation by pressure on the trachea. They should be made of sufficient length—in as many places as required;—they should be carried quite deeply through the diseased tissues, and should be repeated as often as necessary. Two, three, or four inches will be a sufficient length in most cases; but it can never be necessary to gash a limb from hip to ankle. They should not be permitted to bleed long;—and hæmorrhage, if profuse, is best stopped by continued pressure with the fingers on the bleeding points. The subsequent measures are poultices, followed by nitric acid lotion; and bandages to prevent lodgment of matter and sinuses.*

SECTION III.—PYÆMIA, AND THE CONSEQUENCES OF SEPTIC LIQUIDS INTRODUCED INTO THE VEINS.

Definition.—Pyæmia is a diseased state of the blood, caused by the introduction of decomposing animal matter; often producing rapid effusions of fibrine or of puriform fluid into several internal organs.

Symptoms.—The symptoms are those of puerperal fever, erysipelas, and dissection wounds. If a patient, after parturition, injury, or operation, is seized with severe shiverings, pulse rapid, countenance anxious, weight about the heart, spirits low, healthy suppuration (if any) arrested, tongue dry, tight headache, sleeplessness, sallow skin, and nausea, this disease may be predicated. But there is an almost infinite variety in the further progress and specific symptoms in various cases, depending on varieties in the kind or mode of action of the blood-poison; and these we proceed to enumerate.

1. In some cases the patient sinks; life is extinguished by the poisoned state of the blood, without the development of any local disease.

2. In a second set the poison expends its chief force on the liver, which exudes an immense quantity of dark bile, discharged by vomiting and purging. This seems to be a natural and beneficial effort at elimination.

3. The bowels may be the part to which the poison is determined; then, there is great discharge of mucous, or serous, or bilious, or bloody liquids, of various colours and fœtor, and after death the mucous mem-

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* Vide James, op. cit.; Copland, Dict.; Higginbottom on Nitrate of Silver; Copland Hutchinson's Surgical Observations.

brane is found intensely congested. This too seems salutary in its intention. This second and third set of cases correspond to the bilious and dysenteric forms of puerperal fever.

4. Inflammation of the serous membranes may ensue; rapid pleurisy, cough, dullness on percussion from effusion of bloody or turbid serum; or pericarditis; or effusion into the head, with delirium and coma; or peritonitis, tenderness and tightness of the abdomen, patient lying on his back, and not breathing with the diaphragm.

5. The skin may be, though less commonly, affected. There may be profuse offensive perspirations, or in some cases an attack of erysipelas, or an eruption of carbuncles, or of pustules like those of small-pox.

6. Lastly, the most characteristic effect is that from which the name *pyæmia* is derived; namely, the production of profuse suppuration. There can be no doubt that decomposing pus or fibrine, mixed with the blood, spoils a considerable portion of its ingredients, and that the blood elements so spoiled, are deposited in the form of unhealthy fibrine, which usually softens down into *puriform fluid*. Thus are formed the abscesses, which are sometimes called *secondary*, or *metastatic*, or *purulent depôts*,—names which are correct enough, in so far as they imply that the puriform fluid is deposited in, and not elaborated by, the suffering part, which may be said to be, pathologically, more sinned against than sinning. The most usual situation of these abscesses are, as might be expected, the lungs and liver, parts much traversed by blood; but they may occur in the eye, the joints, or any other part, and may form with extreme rapidity. The patient, who may be lying in bed, with anxious, sallow countenance and rapid pulse, but no particular local symptoms, may all of a sudden complain of excruciating pain in the shoulder or calf, or some other part. This may pass off by degrees, with no great or mischievous effusion; or, on the other hand, in a few hours the part so complained of may be found a bag of pus. Abscesses in the lungs or liver do not often give rise to much pain. We must add to the list of consequences, the possibility even of gangrene of the œsophagus, or of any other part, internal or external.

Amongst the forms of suppuration, one that is common is that to which the name diffuse inflammation of the cellular tissue has been given. It appears to be the cellulo-cutaneous erysipelas, without the affection of the skin. A rapidly-increasing swelling appears on one of the limbs, or on some part of the trunk. Its surface is tense, shining, and usually pale. When pressed upon, it feels in some cases hard and resisting, but more frequently it yields that peculiar, semi-elastic sensation described by the term *boggy*, or *quaggy*. There is always most excruciating pain,—which in some cases is burning and throbbing, in others heavy and tensive. The disease is invariably attended with fever of an asthenic character. The pulse is always frequent; it may be sharp and jerking, but is without strength and steadiness. The countenance is anxious and haggard; the mind irritable and desponding, and delirious at intervals; respiration quick and laborious. In unfavourable cases, low muttering delirium, copious offensive perspiration, and jaundiced skin, usher in the fatal termination.*

This form of inflammation is produced by dissection wounds, glanders, and snake-bites.

Prognosis.—This disease is always serious; often fatal. The patient's chances of recovery may be estimated by a knowledge of the characters of the prevailing epidemic; by considering the amount of local mischief; and the degree in which the constitution seems able to resist the disease, as indicated by strength of pulse, clearness of intellect, sleep, or the reverse. The disease may prove fatal rapidly; or the patient may linger, and slowly sink from abscesses or visceral disease; or, he may recover, if the amount of local mischief is not great, and if the excretory organs are enabled to get rid of the poisonous material before the patient is quite exhausted. The author has been repeatedly struck with the immense quantities of lithate excreted with the urine of women recovering from slight attacks of puerperal fever.

Causes.—1st. The predisposing causes are those that produce a low state of constitution, and render the blood incapable of forming a firm clot; such as profuse loss of blood; deprivation of food; anxiety of mind; organic disease; impure states of the atmosphere; residence in the contaminated air of an hospital. 2ndly. Disturbance of the coagulum in a wounded vein; as by exercise of an arm after venesection, or imprudent movements soon after parturition; local circumstances interfering with the closure of veins, such as the patulous condition of the veins of bone, of the liver, and of the sinuses in the dura-mater, which allows of the ready passage of diseased fluids into them. A very large proportion of cases of pyæmia are found to follow injuries and operations on the bones. 3rdly. Infection or contagion from puerperal fever or erysipelas; or inoculation with putrid fluids.†

Treatment.—The leading indications are, 1, to purify the blood; 2, to keep up the strength. For the first purpose it is well to give one ten-grain dose of calomel, and to follow it by purgatives; saline purgatives, F. 33, 34, 35, 42, if the bowels are torpid—milder ones, as rhubarb and castor-oil, if they are inclined to diarrhœa; endeavouring to bring away black or yellow fetid stools, not mere water or slime. An emetic may sometimes be of service. For the second purpose, good beef-tea and port wine are of most value; but it will be very desirable to consult the patient's taste. Some patients crave for bottled beer: others for soda-water, with or without brandy; or milk, or lemonade, or nitro-muriatic acid, F. 22, or simple effervescing draughts; and in almost all cases the dictates of nature may be safely yielded to. Pain and restlessness may be allayed by regular doses of opium, administered in sufficient quantity to produce sleep at night and to tranquillise the nerves; such as eight or ten grains of Dover's powder at bedtime, with a small dose of hyd. c. cretâ; and smaller doses of Dover's powder during the day. In other respects, the practitioner must treat symptoms: local pain and tenderness by a few leeches and fomentations; inflammation of pleura, or peritonæum, or joints, by leeches and bran or mustard-poultices, or blisters; diarrhœa, if exhausting, must be moderated by chalk or bismuth mixture, and by isinglass; and in all respects the strength should be husbanded, and the constitution assisted in its struggles with this too-fatal disease.

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* See two papers in the Edinburgh Medical and Surgical Journal for 1825, vol. xxv.; Copland's Dict. *Art.* Cellular Tissue; James on Inflammation; Travers on Constitutional Irritation; and Butler on Irritative Fever, Devonport, 1825, which gives an account of an extraordinary visitation of this disease in Plymouth Dockyard in 1824.

† See Robert Ferguson on Puerperal Fever, Lond. 1839; Arnott, M. C. T. xv.; Henry Lee, Med. Gaz. vol. xxxviii.; London Journal of Medicine, March and July, 1850; also Med. Chir. Trans. for 1852.

Whenever suppuration or puriform deposit takes place, incisions are necessary, on the same principle as in phlegmonous erysipelas.

SECTION IV.—PHLEGMASIA ALBA DOLENS.

THIS disease apparently depends on the reception of poisonous fluids into the veins, the coagulation of the blood in them, and the exudation of fibrinous matter into the tissues in which the affected veins and their branches are situated.

The *symptoms* are peculiar, and well expressed by the threefold name. There is swelling, considerable, firm, and not œdematous; with the surface of the skin pale; intense heat; very excruciating pain; and loss of all power of using the muscles. The importance of this disease depends very much upon the circumstance whether it is purely local, or accompanied by general blood-infection. If local, the consequences are obliteration of venous trunks, obstinate swelling and œdema of the parts below; perhaps abscesses around the affected veins. If accompanied with pyæmia, there will be some one or more of the consequences of that disease which we have just described. This, like all other diseases of its class, is most common in women after parturition, especially if they have *lost much blood*; and the open veins of the uterus, and the fetid discharges with which they are in contact, furnish a ready explanation of the cause. The part affected is generally the thigh. But it is not confined to women, as the following cases from the author's note-book will show. A very stout gentleman had for two years a small fistulous orifice in the ham, resulting from a boil. This became the seat of fresh inflammation, and was freely laid open with great relief. On the fifth day he was rather feverish; there was an obscure doughy swelling, not œdematous nor fluctuating, over the inner part of the thigh; there was no pain, but a sense of tightness. This increased during the next three days, and became painful, till the whole thigh was greatly swelled and doughy, the leg œdematous. A hospital-surgeon insisted that there must be deep-seated suppuration; and made a long and deep gash on the outside of the thigh. The parts cut seemed gelatinous, and exuded very little blood, no pus, and no serum. The pulse gradually rose; headache, diarrhœa, and delirium came on. The thigh continuing in *statu quo*, the hospital-surgeon made deep punctures in the upper part of the limb with a grooved needle: neither serum nor pus exuded. Death on the twentieth day. The writer has also seen it in a gentleman, recovering from a sloughing sore produced by scarlet fever.

Treatment.—For the local symptoms, nothing answers so well in the case of women, as warm poppy fomentations, or bran poultices sprinkled with laudanum; and, later in the case, gently smearing with opiate liniments, F. 147, and wrapping up in flannel bandages. The bowels should be gently relieved. Opium should be given to allay the pain. All lowering and violent remedies are hurtful.*

CHAPTER XII.

ULCERATION.

SECTION I.—THE PATHOLOGY OF ULCERATION.

PATHOLOGY.—Ulceration consists in the progressive softening and disintegration of successive layers of the ulcerating tissue.

SYMPTOMS.—It generally begins as an *excoriation, i. e.*, slight inflammation, with loss of cuticle. Then the skin beneath begins to melt away, its surface being covered with a tenacious slimy matter. If this is wiped off, or separates, the surface underneath is seen to be red, and it easily bleeds. Supposing the case to proceed, there is formed a chasm, eaten into irregular hollows, with intervening red eminences, which easily bleed if touched; its edges are ragged or undermined; the surrounding skin red, hot, and swollen; there is a thin serous, or bloody discharge, and a severe gnawing pain. An ulcer having these characters may always be considered as extending itself.

Ulcers spread with varying degrees of rapidity. An attack of violent inflammation may cause the death of a considerable portion of the affected tissue in a very short time; then there is said to be a *sloughing ulcer*. When an ulcer spreads very rapidly, but regularly and without sloughing of any great portion at one time, it is called *phagedænic*. And when it spreads more rapidly still, not by one fit of sloughing, but by the constant reiterated mortification of considerable layers, the disease receives the name of *sloughing phagedæna*.

PATHOLOGY.—The ulcerative process generally consists in the inflammation, and infiltration with unhealthy lymph, of a part whose vitality is already greatly impaired, and in the gradual disintegration and discharge both of the exudation and of the tissues in which it is situated. Secondly, it may consist in the destruction of the surface of a tissue, by some poison, as that of syphilis, which has the power of giving its own properties to the solids and fluids around, so as to propagate the means of increasing destruction. Or, thirdly, in the softening and discharge of some special morbid deposit, and of the parts in which it is found, as in the ulceration of Peyer's glands in typhoid fever, or of any part infiltrated with scrofulous deposit, as in lupus. Lastly, a primary ulceration, *i. e.*, a softening and disintegration from mere debility, independent of inflammation or other anterior change, may occur, as in the cornea, during periods of intense debility.*

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* See Mackenzie on Phlegmasia Dolens, Lancet, March 19, 1853.

It will be noticed in its proper place, that bone, and cartilage, and teeth, sometimes ulcerate by disintegration, sometimes seem to be removed by a rapid cell-growth in the textures in contact with them.

PREDISPOSING CAUSES.—The *Tissues* most disposed to ulceration are the skin, and the mucous and synovial membranes. From these it may spread to other subjacent tissues, which yield to it with varying degrees of rapidity. The areolar tissue ulcerates very easily, but muscles, blood-vessels, and nerves, very slowly; so that they often appear to be as it were dissected out in spreading sores, by the destruction of the areolar tissue around them. Tendons and ligaments are also very slow to ulcerate owing to their physical qualities; but cartilage, bone, and the cornea are in certain constitutions extremely liable to it. The serous membranes very rarely ulcerate primarily.†

The *Constitutions* most liable to ulceration are those which are debilitated by intemperance or privations;—tainted with syphilis or scrofula;—or broken down by the excessive use of mercury;—or in which the blood is impure from inaction of liver, skin, and kidneys.

The *parts* most disposed to it are those whose circulation is most weak and languid; such as the lower extremities: and more especially if the return of their venous blood be in any way impeded by a varicose state of the veins. On this account, tall persons are much more frequently affected with ulcers of the legs than the short. Sir E. Home shows, on the authority of Dr. Young, that twenty-two out of one hundred and forty-five tall men, and only twenty-three out of two hundred and seventy-six short men, were discharged from a regiment in the West Indies in four years, on account of ulcers.

Defect of nervous influence may cause parts to ulcerate or mortify. Ulcers of the cornea have followed injury to the fifth, and ulceration of the hand has followed injuries of the median nerve.‡ But whether the tendency to ulcerate is produced directly, or whether it follows indirectly from loss of sensibility to injury, is a question.

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* The former editions of this work contained a copious array of arguments, in favour of the disintegration theory of ulceration, as opposed to the absorption theory of Hunter; but it is not necessary to repeat them now, since the question may be considered as settled. For further information, consult Mr. Gaskell's MS. Jacksonian Prize Essay on Ulceration, in the Library of the College of Surgeons in London, and the preparations accompanying it: also J. W. Earle, Med. Gaz. for 1835; C. Aston Key, Med. Chir. Trans., vol. xviii. and xix.; Copland, Dict. Pract. Med. *Art.* Inflammation; Pearson's Principles of Surgery; and particularly Wallace on the Venereal Disease, Lond. 1838, p. 47.

† There is a specimen of ulceration of peritoneal coat of stomach. Organs of Digestion, 76, Musée Dupuytren, Paris.

‡ See cases quoted by Paget from Swan and Hilton. Med. Gaz. N.S. vol. iv. p. 1023.

EXCITING CAUSES.—In constitutions or parts predisposed to it, the slightest irritation may be sufficient to excite ulceration. In the healthy it may be produced by the continuous application of some irritant, such as continued pressure, or contact with poisonous secretions.

SECTION II.—THE VARIETIES OF ULCERS.

DEFINITION.—It is not easy to give a rigorous definition of the term ulcer, nor is it necessary. For all useful purposes, it will suffice to say, that it signifies a chasm on the surface of any organ caused by the stripping off of its proper cuticle or epithelium, or by the destruction of a portion of its substance by disease, or by injury which has not been repaired.

Ulcers present many varieties, which may be classed under three heads. 1. *Healing.*—They may be in a state tending to reparation; as the healthy ulcer. 2. *Stationary.*—Their surface may have an imperfect form of organisation, under which they may be incapable of healing, though they are not necessarily spreading; the weak and indolent ulcers are examples. 3. *Spreading.*—They may be under the influence of the destructive process which formed them originally, and which is still causing them to spread; as the phagedænic.

I. THE HEALTHY or HEALING ULCER is nothing more than a healthy, granulating, and cicatrizing surface. The granulations are small, numerous, florid, and pointed, and yield a moderate secretion of healthy pus. The edges are smoothed and covered with a white or bluish semi-transparent pellicle, which is gradually lost on the margin of the granulations. In favourable cases such an ulcer may cease to granulate and suppurate, and may fill up with moist lymph, which rapidly cicatrizes.

Treatment.—The only treatment required will be a little dry lint, if there be much discharge, or the water-dressing, or simple ointment, if there be not. If there be not much discharge, the dressings should not be changed more frequently than every second or third day. If the granulations are too luxuriant, they may be touched with lunar caustic, and dressed with dry lint. If the granulating surface is very extensive, or if all applications disagree with it, as sometimes happens, it will be expedient to form a *scab* on its surface; by sprinkling a little chalk on the surface, or by passing a stick of lunar caustic over the surface of the sore, as recommended by Mr. Higginbottom. This salt instantly coagulates the fluids on the sore, and forms a white pellicle, which soon becomes dry and black, and is much less irritating than an ordinary scab. If the scab act favourably, suppuration ceases, and cicatrization will be found complete when it is detached.

II. THE INFLAMED ULCER, with which we may conjoin the IRRITABLE ULCER, are hot, tender, and subject to gnawing pain. The surface is red and easily bleeds; the discharge is thin and ichorous. The usual situation is the leg; the class affected, the labouring population; the predisposing cause, an unhealthy state of skin from degeneration of the veins; the exciting cause, any injury whatever occurring at a time when the health is deranged. A thin, foul, copious discharge is generally a true natural process of elimination, and requires purgatives.

Treatment.—The patient should be kept in bed with the limb raised on a pillow. The first point is to amend the general health. For this purpose, if the tongue is white, and the patient feverish, active purgatives must be given (F. 33), with salines (F. 39). For the local treatment, in the first place soothing applications should be resorted to; and the author, from very extensive experience, most strongly recommends the poppy lotion (F. 121) applied warm, by means of pieces of lint covered with oiled silk, and changed three times daily. Washing should be effected without touching the sore. Plain bread-and-water poultices (F. 153) and lead lotion sometimes answer well. If warm applications aggravate the pain, cold evaporating, or saturnine lotions (F. 115, &c.) should be used, the sore being protected by a piece of oiled silk or simple dressing.

When feverishness has been relieved, and the bowels well opened, pain may be relieved by henbane, or hemlock, or F. 30; or, if very severe, and there is great mental anxiety, the patient should have such a dose of solid opium at night as will insure sleep, and such smaller doses during the day as may be requisite.

Then if the soothing plan ceases to do good, *very mild stimulants* may be tried, in the form of lotions, applied by means of small pieces of lint thoroughly soaked, laid gently on the sore, and not beyond the edges, and covered with oiled silk, or lint thickly spread with spermaceti ointment. The lotions of nitrate or acetate of lead, or of zinc (F. 116), and black wash, are the best. Should these not answer, and the pain of the ulcer depend evidently on irritable *surface*, and not on inflammation, the surface may be destroyed by lunar caustic, or by nitric acid.

III. THE WEAK ULCER has large, pale, flabby, and insensible granulations rising above the margin of the skin, and showing no disposition to cicatrize.

IV. THE INDOLENT ULCER has its surface smooth and glassy, and of a pale, ashy colour, like a mucous membrane. Sometimes, however, it displays a crop of weak fungous granulations. The edges are raised, thick, white, and insensible; the discharge scanty and thin. Such ulcers are often stationary for a great length of time; but from any slight cause of irritation, may enlarge rapidly by ulceration or sloughing; and even when they have made considerable progress in healing, the granulations and cicatrices that have been months in forming may perish in a few hours from some constitutional disturbance or local injury.

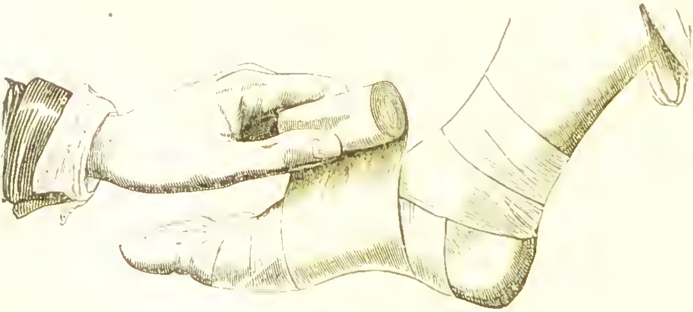
Treatment.—The general rules are, to promote constitutional vigour by good diet and tonics, to excite the local actions by various stimulants, and to support the venous circulation in the affected part.

The following is perhaps the best plan of curing these ulcers. A number of pieces of lint, thoroughly soaked in the nitric acid lotion, should be laid on the sore, and be covered with a warm soft poultice. These applications should be changed twice a day, and be continued till the discharge becomes healthy, and granulations begin to arise. During this time the patient should be confined to bed and be purged. Afterwards, when the surface is clean, the following mode of dressing may be adopted. First, some pieces of lint, saturated with the nitric acid lotion, or zinc lotion, or with some other stimulating substance, should be laid on the sore. Then strips of adhesive plaster, about 1½ inch wide, should be applied *two-thirds round the limb*, from an inch below the ulcer to an inch above it; and in applying each strip, the edges of the sore should be drawn together with a moderate degree of force. Next, a compress of soft linen should be placed over the plaster, and, finally, the limb should be well and evenly bandaged from the toes to the knee; observing that the bandage is to be applied most tightly below, and more loosely by degrees as it ascends.

The frequency with which the dressings should be changed, must depend on the state of the discharge; for if that be profuse they should be changed every day; otherwise from twice to four times a week will suffice.

One thing scarcely noticed by writers, but perhaps of more consequence than most plasters, is the observance of *perfect cleanliness.* When it is considered how filthy the habits of many persons are, who often leave their legs and feet unwashed for weeks and months together, it cannot be wondered that skin so neglected should, in the decline of life, possess a very imperfect vitality; and the author is convinced by experience, that daily washing the lower limbs with a piece of flannel and yellow soap and water, is one of the best means of reviving their decayed powers.

During this plan of treatment, the patient may, after the first few days, walk about moderately; but he should not stand about, nor sit with the leg hanging down.



If the common strapping irritate the skin, the empl. plumbi, spread upon cheap thin *split* leather, or the isinglass plaster, will answer better.

But although the plastering and bandaging are adapted for most cases, the immediate application to the ulcer will require to be frequently varied. Sometimes the strapping may be applied without anything else; or dry lint may be placed under it; or lint imbued with lotions of sulphate of copper, or alum; or with lotions made by adding half an ounce of the tincture of myrrh, or of benzoin (comp.), or aloes (comp.), to four ounces of water; or the balsams of copaiba or Peru; but metallic preparations agree better in general than the vegetable. The author fancies that resinous lotions and ointments are best when the skin is irritable and *eczematous*, or covered with scales of cuticle which readily peel off. In such cases plasters cannot be borne. The ung. hyd. nitric. oxid. is very useful; —and the ung. hydrarg. nitrat. dilut. is praised for its efficacy in reducing thick callous edges. The green ointment is worth a trial. F. 171.

Particular Plans of Treatment.—From the middle of the last century, when the surgeons of St. Thomas's Hospital were in treaty with an apothecary in Half Moon Street for the purchase of an infallible method of healing ulcers, or rather from time immemorial to the present, the multitude of plans recommended for the treatment of ulcers, shows but too truly that they all often fail.

Pressure forms the basis of many plans; as Baynton's and Scott's, according to which the affected limb is enclosed in strips of plaster, regularly applied from the foot upwards.* A well-applied calico bandage is always of service. A laced stocking, or elastic stocking, is still better. Pressure may be combined with exclusion of the atmosphere; as in the plan of Mr. Stafford, who recommends old, deep, indolent ulcers to be treated by filling up their cavity with a mixture of one part of Venice turpentine, and four of bees' wax, melted, and poured in warm. Mr. Syme covers an indolent ulcer with a blister. M. Malgaigne is said to use in some cases a warm iron held at a little distance from the ulcer, so as to dry its surface. *Heated air*, or *fumigation* with vapour of sulphuret of mercury, or of iodine with sulphur, has been used by Mr. G. A. Walker and others. The affected limb is put into a tin case, or large jar, provided with a heated iron at the bottom, and with a grating above this, to prevent the patient from being burnt. On the heated iron there is to be sprinkled, just before the patient's limb is subjected to the treatment, a powder composed of thirty grains of sulphur, six of cinnabar, and two of iodine; and the top of the apparatus should be covered with a thick cloth, to prevent the vapour from escaping. The limb may be thus fumigated for fifteen minutes every day, and the quantity of iodine gradually increased fourfold.

Mr. Gay has called attention to the fact that cicatrization proceeds only from the cutis vera, and, consequently, from the edges of an ulcer; that there appears to be great difficulty in cicatrizing a wide surface;

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* Baynton, T., Descriptive Account of a New Method of Treating Old Ulcers of the Legs, Bristol, 1797; Barnes, Lancet for 1847, vol. i.; Critchett, James Arnott, Chapman, and others in Lancet for 1848 and 1849; Burgess's Cazenave, p. 288; Gay, Lancet, 1853, vol. i. p. 566.

and that nature causes the skin to contract, so as to cover the vacancy, in preference to forming a large cicatrix;—and that the healing of many ulcers is delayed because the surrounding skin cannot contract; either through adhesions which bind it down to the subjacent parts, or through extensive loss of skin, or from the fact that the sore is situated on a projecting part, as the ankle. Hence he proposes, in some cases, to liberate the edges of the sore by incisions parallel to, and at a little distance from them; or to excise the edges and surface of the ulcer, when firmly bound down by hardened tissue.

Should old ulcers be healed?—The propriety of healing old ulcers has often been made a question, inasmuch as certain diseases, and especially apoplexy, palsy, and mania have been said to come on afterwards. Sir E. Home specified the following cases in which a cure ought not to be attempted. 1. If the ulcer be "evidently affected with the gout, having regular attacks of pain, returning at stated periods; and those attacks similar to what the patient has experienced from gout in other parts." 2. If an ulcer habitually occur whenever the constitution is disordered. 3. If the patient be very infirm and old; for under these circumstances the removal of an habitual source of irritation, or the diversion of an habitual afflux of blood may prove fatal; more especially as very old ulcers have been known to heal spontaneously a short time before death.

To these cases must be added that of ulcers on the legs of stout women, about the critical time of life, and displaying a tendency to discharge copiously as the periodic uterine flux diminishes.

On this point we may observe, 1, that in the case of every habitual ulcer, purgatives should be freely used during the cure, and for some time after it. 2. That if, spite of this, there be symptoms of congestion in the head, an issue or a seton in a convenient situation may answer the purpose of an ulcer in an inconvenient one; and, therefore, that with these safeguards ulcers on the legs may always be healed, —if possible.

VI. THE FISTULOUS ULCER (*Fistula* or *Sinus*) is a variety of the indolent, and consists of a narrow channel lined by a pale pseudo-mucous membrane, which may or may not lead to a suppurating cavity. In old cases the parietes of the tube are often dense and semi-cartilaginous.

Causes.—Fistulæ are produced when abscesses are not thoroughly healed from the bottom; when there has been a defect in the bandaging or in providing proper outlets for the discharge; or when there is some standing cause of irritation, as a ligature, or a piece of dead bone, which keeps up a discharge of pus.

Treatment.—The first indication is to remove any source of irritation that may happen to exist, and diseased bone should always be looked for. The second, to prevent the lodgment of matter; for which purpose it may perhaps be necessary to make another opening. The third indication is to produce, by stimulating injections, especially the strong caustic lotion, the destruction of the pseudo-mucous lining, and to cause the exudation of plastic matter, so as to fill up the fistula. At the same time the sides of it should be kept constantly pressed together with compress and bandage. If these means fail, the fistula should be slit up with a bistoury; and then a thin piece of lint be introduced in order to prevent premature union of the cut edges, and make it heal from the bottom. The fine-wire cautery, invented by Mr. Marshall, which can be passed into the track, and then heated to a white heat by means of a galvanic current, is a very efficient instrument, both for the vivification of the interior of a fistula, and for laying it open without hæmorrhage,—the white-hot wire cutting its way out readily.*

If there have been a succession of small unhealthy abscesses in a part, or if ulceration have spread irregularly in the cellular tissue, so as to leave the skin ragged and extensively undermined with tortuous sinuses, it may be advisable to destroy the whole of the parts so diseased by the potassa fusa; and this will stimulate the neighbouring sound parts, so that when the slough separates, a healthy surface will be left, which may be healed by the ordinary means.†

VII. The Varicose Ulcer occurs in consequence of a varicose state of the veins of the lower extremity. This greatly impedes the return of blood, and, by producing habitual venous congestion, weakens the parts, and renders them prone to ulceration. The ulcers are usually three or four in number, situated above the ankle. They are oval in shape, indolent in their progress, and neither extensive nor deep; but they are attended with considerable pain, which is of a deep-seated, aching character.

The *Treatment* must be directed principally to the veins; and for this we must refer to the chapter on that subject. We will merely observe here, that the applications to the ulcers must be suited to their condition, whether irritable or indolent; and that great relief to the pain is sometimes obtained by opening one of the enlarged vessels, and abstracting a moderate quantity of blood. The advantages of proper support by bandages or laced stockings, or by encasing the limb in strapping from the foot upwards, need scarcely to be noticed. Sometimes there is a constant desquamation of the cuticle, with serous discharge, for which the best remedies are equal parts of lime-water and milk, or the ointment of chalk (F. 164), or oxide of zinc, or F. 131, or 188.

VIII. The Sloughing Ulcer is formed whenever either of the other varieties of ulcer is attacked with sloughing,—which is particularly liable to occur to the *indolent*, when subjected to undue irritation. Or, this name may be given to ulcers originally produced by a sloughing of the skin,—as on the legs of the dropsical.

Treatment.—The best applications are warm fomentations of poppy decoction, to which a little spirit has been added; poultices of yeast or carrots; or the nitric acid or chloride of lime lotion on lint; or the creosote ointment F. 163, which the author particularly recommends.

IX. Phagedæna is a peculiar variety of ulceration in which copious exudation, and infiltration of the affected part, go hand in hand with rapid decomposition. The surface of the sore is irregular, generally whitish or yellowish; the discharge serous or bloody, and often extremely profuse; and the pain extreme. Some cases are attended with fever and acute inflammation, the margin of the sore being highly painful, swelled, and red,—others with atony and debility, the margin being pale, dusky, or livid.

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* Med. Chir. Trans. vol. xxxiv.

† Liston, Elements of Surgery.

Causes.—This disease may be induced either by extraordinary local irritation, or by some peculiar constitutional disorder. It may attack primary or secondary venereal sores, in consequence of filth, intemperance, the abuse of mercury, or of a weakened and vitiated, or scrofulous habit, or of some peculiarity in the venereal virus. Sometimes it appears in the throat after scarlatina; it may attack a blistered surface when the constitution has greatly suffered from an acute and exhausting disease, as measles, &c.; sometimes it affects the mouth or genitals of children, constituting *cancrum oris*, *noma*, &c.

Treatment.—One of two courses may be taken. The *soothing*, consisting in the administration of opium with bark, wine, and good nourishment, and the local applications directed for *irritable ulcers*, especially a weak solution of tannin, F. 131. This will often be found successful; if not, recourse may be had to the destruction of the diseased surface by caustics, in the manner described in p. 74.

X. SLOUGHING PHAGEDÆNA, or HOSPITAL GANGRENE, seems, says Mr. Lawrence, to be a state of phagedæna carried to its fullest extent. Its *causes* are, (1) *great local irritation*, combined with a vitiated state of the constitution. (2) *Contagion*; that is, the application of poisonous matter to a wound: and (3) *infection*; that is, the reception of poisonous miasmata into the blood. We shall first treat of it as it occurs sporadically in civil practice, where it bears the name of *sloughing phagedæna*; and next, of those more serious visitations that decimate the patients in crowded naval or military hospitals, whence it derives its other name, *hospital gangrene*.*

In the cases seen in civil practice, the disease is mostly seated in or near the genital organs; in the cleft of the nates, in the groin, or at the upper and inner part of the thigh. It often supervenes on syphilitic ulcers; especially in young prostitutes, who have been exposed to cold and wet and privation of solid food, and the abuse of ardent spirits. It is especially liable to be induced by the too free administration of mercury, or by intemperance and exposure to wet during a mercurial course. The worst cases, however, appear to arise from neglected local irritation without any specific virus; as from acrid discharges and defective cleanliness. Mr. Lawrence mentions the case of a young woman who had suffered from severe small-pox, and from diarrhœa after it. The continual moisture from the rectum, with a mucous discharge from the vagina, irritated and inflamed the skin of the nates, and caused a large sloughing phagedænic excavation on both sides.

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* In civil hospitals any serious attack of hospital gangrene is almost unheard of. Yet it appeared in 1844 in University College Hospital. Liston, Lancet, 1845, vol. i. p. 57. In the Middlesex Hospital in 1835, South's Chelius, vol. i. p. 67. The disease appeared in St. Bartholomew's Hospital and in St. George's in 1847; C. Hawkins, Med. Gaz. N. S. vol. iv. p. 1026. An account of its ravages in the British camp after the battle of Ferozepore, by Mr. Taylor, surgeon to the 29th Regt., is quoted by Guthrie, Lancet, 1848, vol ii. p. 714.

Symptoms.—"It usually commences as a highly-irritable and painful boil, surrounded by a halo of dusky-red inflammation, and much elevated; the patient also in general having mucous discharges from the vagina, and a diffused redness of integument in the vicinity of the pudenda." There are severe darting and stinging pains, which are at first intermittent, but gradually establish themselves as a constant symptom, with occasional exacerbations. When the pustule is ruptured, the exposed surface of the ulcer displays a stratum of adherent straw-coloured flocculi, mottled with darker points of reddish-brown and gray. The sore thus formed soon enlarges in breadth and depth; the edges become everted, and attended with a circumscribed thickening which is surrounded by dusky inflammation and diffused puffy swelling. The surface is composed of gray or ash-coloured sloughs, which may become brown, or resemble coagula of blood. The discharge is reddish-brown, and peculiarly fœtid, and there is occasionally severe hæmorrhage. Meanwhile the agonising pain, the hæmorrhage, and the absorption of putrid matters, soon induce severe irritative fever,—with loss of sleep, anxiety, restlessness, thirst, and exhausting diarrhœa;—which, if not relieved, may produce death in about three weeks; and, as delirium is rare, the patient retains a miserable consciousness of severe suffering to the end.*

HOSPITAL GANGRENE is the name given to this affection when occurring in military and naval practice. It is engendered by crowding together a number of sick and wounded men, and by inattention to cleanliness and ventilation. It frequently is a concomitant of dysentery or typhus, originating in the same sources. It may affect any kind of wound, or even a mere bruise.

Symptoms.—According to Mr. Blackadder, it begins in the form of a livid vesicle at the edge of a wound or sore, accompanied with an occasional painful sensation like the sting of a gnat. Sometimes it first appears as a small livid spot on the sore, and near its circumference. In either case the disease soon spreads, and converts the whole surface of the ulcer into an ash-coloured or blackish slough. The discharge, if previously healthy, is at first diminished in quantity, and sanious; but soon becomes profuse, dirty yellowish, or brown, and offensive. According to Mr. Blackadder, the hospital gangrene is at first a purely *local* affection, like the sloughing phagedæna; and he says that the constitutional symptoms do not make their appearance before the third or fourth, sometimes not till the twentieth day.†

But the disease, as observed by Dr. Hennen, began with constitutional symptoms, headache, nausea, perhaps bilious vomiting, quick pulse, hot skin, and an inflamed, dry, glassy, and painful state of the wound; to which succeeded sloughing of the surface of the wound, great swelling of the edges, and the other local and constitutional symptoms of sloughing phagedæna.*

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* Welbank, Med. Chir. Trans. vol. xi.; Lawrence, Med. Gaz. vol. v.

† Observations on Phagedæna Gangrenosa, by H. Home Blackadder, Edinburgh, 1818; Guthrie, Commentaries on Military Surgery, 6th ed.

It thus appears that the hospital gangrene may be either a local disease, caused by the influence of poisonous matter on a wound, or that it may be constitutional from the first, and be caused by the absorption of a septic poison into the blood.

Treatment.—The indications in the treatment of all the forms of sloughing phagedæna are, 1, to destroy the diseased surface and its secretions; and 2, to correct the disorder of the system.

The first indication is to be carried into effect by means of caustics. The French use the actual cautery; but the concentrated nitric acid used in the following mode, as directed by Mr. Welbank, seems to be the best. In the first place the sore must be thoroughly cleansed, and *all its moisture be absorbed* by lint or tow. If the sloughs are very thick, they may be removed by means of forceps and scissors. The surrounding parts must next be defended with a thick layer of ointment: then a thick pledget of lint, which may be conveniently fastened to the end of a stick, is to be imbued with the acid, and to be pressed steadily on every part of the diseased surface till the latter is converted into a dry, firm, and insensible mass. This application of course causes more or less pain for the moment; but, when that subsides, the patient expresses himself free from his previous severer sufferings. The part may then be covered with simple dressings and cloths wet with cold water. "It is always prudent, often necessary," says Mr. Welbank, "to remove the eschar at the end of sixteen or twenty hours, and then, if the patient be free from pain, and the ulcer healthy and florid, it is to be treated with common stimulating dressings, such as cerat. calaminæ, or solution of argenti nitras, or a cerate of turpentine, which may be melted and poured in warm." If, however, there be any recurrence of pain, or the least reappearance of the disease, the acid is again and again to be applied till a healthy action is restored.

As for the general treatment;—the patient should be narcotized by chloroform during the application of the acid. Opium should be given in sufficient doses to procure sleep at night, and to relieve pain during the day. If the disease, as observed by Hennen, begin with shivering and fever, the treatment may be begun with purgatives, as directed for erysipelas, p. 58, to which this disease is most nearly allied. The same rules are applicable also as regards diet, since it is on wine or brandy, beef-tea, and other forms of nourishment, and yellow bark with nitric acid, that the surgeon's chief dependence is to be placed. Change to a pure air, free ventilation, and destruction of all putrescent matters, need not be more than mentioned.

XI. GANGRENOUS INFLAMMATION OF MUSCLE, as described by

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* Principles of Military Surgery, by John Hennen, M.D., F.R.S.E., 3rd ed., London, 1829, pp. 217, *et seq.;* Sir G. Ballingall's Military Surgery; Dr. Boggie on Hospital Gangrene, Edinburgh, 1848; Velpeau, Lancet, 1848, vol. ii. p. 172.

Dr. Lyons,[*] from his observations in the Crimea, generally affected soldiers who had received wounds, or suffered amputation in the thigh. With little or no swelling or pain, or change in the skin, the muscles gradually melted down into a soft, putrid, shreddy mass, and were discharged with immense quantities of fetid ichor. Indistinct febrile symptoms, with diarrhœa, accompanied the local disorder. The patients were generally exhausted by hæmorrhage and discharge in the course of from two to six weeks.

XII.—Malignant Pustule (Charbon) is a contagious and very fatal disease, common in France, but almost unknown in England. It commences as a little dark-red spot, with a stinging or pricking pain, on which there soon appears a pustule or vesicle seated on a hard inflamed base. When this is opened, it is found to contain a slough, black as charcoal; and the sloughing rapidly spreads, involving skin and cellular tissue, and sometimes the muscles beneath.

The account given of this malady by the continental writers is exceedingly confused; but it appears certain that it is caused by infection or contagion from horned cattle, which at certain seasons are affected with a precisely similar disease; and it further appears that, like hospital gangrene, it may commence in two ways:—By general infection of the system, from respiring air loaded with miasmata from diseased animals, or from eating their flesh; or by inoculation of the diseased fluids. Mr. Lawrence gives an account of a man in Leadenhall Market, who accidentally smeared his face with some stinking hides from South America. The part touched by the putrid matter very soon became red, and swelled, and mortified, and the mortification spread over half the cheek. He has also met with two other cases affecting persons in a horse-hair manufactory. It is believed that flies which have alighted on the ulcers of the diseased animals convey the virus, and infect other animals and human beings.

The constitutional symptoms and morbid appearances are those of putrid typhus; the treatment, both constitutional and local, is the same that we have directed for hospital gangrene.[†]

XIII. The Ulcer of the Cellular Membrane, which burrows under the skin and destroys that tissue, must be treated as the fistulous or weak, according to circumstances.

XIV. Menstrual Ulcer.—This name is given to ulcers occurring in chlorotic young women, and exuding a sanguineous fluid at the time of their monthly discharge, if that be absent. Wounds made in operating will frequently do the same.

Treatment.—The chlorosis must be remedied by steel, aloes, &c., and the ulcer be treated on general principles.

XV. Lupus non Exedens (*Serpiginous Ulcer of the Face*) is a most obstinate form of ulcer affecting the face, chiefly of young women of a delicate or scrofulous constitution. It begins either as a shining, soft, circumscribed swelling of the skin, usually on one ala of the nose, which ulcerates; or else as a mere crack or small excoriation, covered with a thin scab, under which it slowly spreads. When the scab is removed, the discharge, which is scanty and viscid, soon dries and forms another larger one. The ulcer is constantly spreading in one direction, and healing in another; it may last for years, and wander over the whole face, completely destroying perhaps the alæ of the nose or the eyelids, but in other parts not penetrating the entire thickness of the true skin. The cicatrix is excessively irregular and shining, and of a dense whiteness, causing perhaps eversion of the eyelids and distortion of the features; in some parts it feels soft and pulpy. The cause and pathology of this affection are unknown. The *treatment* consists in the use of soothing local applications, such as water-dressing, black wash, or very weak solution of nitrate of silver or of lead, and of a nutritious diet, cod-liver oil, sarsaparilla, bark, iodide of iron, and other tonics; in some cases of the *chloride of arsenic* in the dose of ten drops thrice daily at meal times, F. 97, from which the author has seen remarkable benefit in cases treated by Mr. Hunt. A mild purgative, F. 38, should be given just before the menstrual period. If the surface forms a scab, the writer finds it best to use no application at all.

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[*] Report on the Pathology of the Army in the East, Lond. 1856.

[†] Lawrence, Med. Gaz. vol. v. p. 392; Dict. de Méd. *Art.* Charbon, *Pustule maligne*; Schwabe, Brit. and For. Rev. vol. vii. p. 550; Lond. Med. Gaz., 21st Oct. 1842; South's Chelius, vol. i. p. 65.

XVI. LUPUS EXEDENS (*Corroding ulcer* of Clarke, *ulcère Rongeante*, *Rodent ulcer* of Paget, *Cancroide* of Lebert; *Esthiomène* of Huguier: *chancrous*, or *cancerous ulcer*, and *Noli me tangere* of older writers*) is an ulcer characterised by slow but constant increase, rebellious to all mild measures of treatment, and ultimately leading to fatal consequences, if not checked. Examples of it are found in the corroding ulcer of the uterus; in the perforating ulcer of the stomach and œsophagus, and in the lupus, or so-called cancroid ulcer of the skin of the face. The exact pathology and cause of the disease are unknown. It is not cancerous; there is no infiltration of cancer cells nor yet of epithelium; the part affected ulcerates cleanly away, as if cut out with a punch, but up to the edge of the ulcer the tissues seem healthy, or at least contain such elements as are found in the base of all ulcers; and there is neither swelling nor hardness, nor adhesion of the part, nor of the adjoining lymphatics. The perforating ulcer of the stomach is most common in young chlorotic women; the corroding ulcer of the uterus in women past child-bearing; lupus exedens of the face in persons above forty, especially women.

The parts of the face most commonly affected are the nose and the cheek below the eye. The disease may begin as a small vascular wart, as a smooth red shining tubercular swelling of the cutis vera, as a little elevation like a mole covered with dried cuticle, or as a small *chap*, or fissure. In this condition it may last for an almost indefinite time, till at length it spreads, forming a foul excavated irregular ulcer, with glassy non-granulating surface, and scanty ichorous discharge, eating away all before it in breadth and depth, till not merely the nose, or cheek, or eyelid may have perished, but the entire face is converted into one horrid chasm, with the eyeball dropping into the mouth.

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* Ure on Lupus and the Chloride of Zinc, Med. Gaz. vols xvii. and xviii.; and Cyclop. Pract. Surg. *Art.* Cauterants; Earle, Med. Chir. Trans. vol. xii.; Travers, *ib.* vol. xv.; Burgess's trans. of Cazenave, p. 250; Brodie, Surgical Lectures; Walshe, on Cancer, p. 548; Liston, Lectures in Lancet, 1844, vol. i. p. 775; Lebert, Traité Prat. des Maladies Cancerέuses, 1851, pp. 594 and 658; Paget's Lectures on Surgical Pathology, vol. ii. p. 452.

Treatment.—Everything may be hoped from free and early cauterization; but recollecting the name *noli me tangere*, the surgeon must be careful to *destroy* thoroughly, and not irritate by inefficient measures. Of *caustics*, therefore, the most energetic should be chosen, such as the acid nitrate of mercury, F. 195; the Vienna paste (or compound of caustic potass with quicklime); the chloride of zinc, or arsenic.

Of these, the *arsenic* is that which from long experience is believed to be the most efficacious. The most convenient mode of applying it is in the form of *Manec's paste;* which is composed of 15 grains of white arsenic, 75 of cinnabar, and 35 of burnt sponge, made into a thick paste, with a few drops of water. This should be thinly spread on the whole surface (previously cleansed from discharge and scabs) of the ulcer, if small; or on a small portion of its surface if large, and be covered with a piece of soft lint. The pain which follows is very severe, and the redness and swelling even alarming; moreover there may be vomiting and purging, symptoms which must be met by the administration of repeated doses of solid opium. At the expiration of a fortnight, if the whole surface were not cauterized at once, a second portion may be attacked in the same way. The eschars are some weeks in separating, and if the surface which remains is unhealthy, it must be destroyed again and again.

The chloride of zinc is generally mixed with three or four parts of flour (as used originally by Canquoin), or with two parts of freshly-burned plaster of Paris (as recommended by Mr. Ure, who introduced it to the notice of English surgeons). Then it is made into a paste with a few drops of water, spread over the ulcer, and allowed to remain for four or five hours. It is nearly as painful as the arsenic.

The general health must be improved by the remedies directed for the *lupus non exedens*, including the cautious and long-continued administration of arsenic, F. 97.

In cases in which cauterization cannot be performed effectually, the general and local palliative treatment are the same as of cancer.

CHAPTER XII.

MORTIFICATION.

SECTION I.—PATHOLOGY OF MORTIFICATION.

DEFINITION.—Mortification signifies the death of any part of the body in consequence of disease or injury.

VARIETIES.—Some persons use the terms *mortification*, *gangrene*, and *sphacelus*, indiscriminately; but it is better to signify by *sphacelus* an utter and irrecoverable loss of life, and to restrict the term *gangrene* to the state which precedes, and commonly (but not inevitably) terminates in sphacelus; and in which perhaps the part may be supposed to be still capable of recovery.

Another distinction is made between *humid* and *dry* gangrene. The *humid* is a consequence of inflammation, or of obstacle to the return of the venous blood; and the mortified part, being loaded with fluid effusions, soon undergoes decomposition; whilst the *dry gangrene* is generally a consequence of deficient supply of blood, or of constitutional causes, and is either preceded by no inflammation at all, or by one so rapid that there is no time for interstitial effusions to occur, so that the mortified part becomes dry and hard. In the humid it is called a *slough*, in the dry gangrene an *eschar*.

Another and a most important division is into *constitutional* and *local*. By *constitutional mortification* is meant that which primarily originates in constitutional disorder; or that which, having begun from a local injury, is propagated and maintained by constitutional disorder. By *local mortification* is understood that which has originated in local injury, and by which the system is not implicated, and with which it does not sympathise in a violent or dangerous degree.*

CAUSES.—The *local predisposing causes* are the same as those of ulceration; namely, congestion, deficient arterial circulation, and structural weakness.

The *constitutional causes* of mortification are,—debility from old age, poverty, starvation, hæmorrhage, scurvy, or long-continued disease of any kind; disease of the heart with contraction of the aortic orifice, so as to impede the arterial circulation; a peculiar state of the blood causing it to coagulate, and the peculiar state induced by the use of diseased grain, especially by the ergot of rye. These causes are in general *predisposing* merely; but sometimes they are sufficient of themselves to induce mortification, which is then mostly seated in the lower extremities.

The *exciting causes* may be divided into—*First*, *mechanical and chemical injuries*, especially gun-shot wounds and compound fractures; the injection of urine into the cellular tissue; the application of irritants to constitutions weakened by previous disease, as the application of blisters to children after measles or scarlatina; long-continued pressure under the same circumstances; hence, the sloughing of the skin over the sacrum or trochanters of patients confined to bed with some exhausting disease,—or the application of heat after exposure to cold.

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* Thompson's Lectures on Inflammation; Guthrie, G. J., F.R.S., A Treatise on Gun-shot Wounds, p. 116, 3rd ed. Lond. 1827; Case of Spontaneous Gangrene, by Dr. Fuller, Med. Gaz., N.S. vol. v. p. 244

Secondly, an *insufficient supply of arterial blood*, whether from ligature of a main artery, from thickening of its parietes so as to contract its calibre, from coagulation of the blood within it, or from degeneration of the artery, and its obstruction by fibrine, which is the supposed cause of *senile gangrene*. Sloughing of the nose from great loss of blood after a wound in the throat—sloughing of the centre of one of the cerebral hemispheres after a wound of the corresponding common carotid—are further instances.* Patches of skin often mortify in œdema and cellulo-cutaneous erysipelas, because its blood-vessels are obstructed by the distention of the subcutaneous tissue with fluid.

Thirdly, *impediments to the return of venous blood*, whether from ligature of a venous trunk, from coagulation of the blood in it, from tumours (diseased liver, for instance) compressing it, or from disease of the heart, or from tight bandages, as sometimes happens after fracture.

Fourthly, *injury or division of nerves*.—Thus, the cornea has been known to slough after division of the fifth nerve. Sir B. C. Brodie has seen mortification of the ankle begin within twenty-four hours after an injury to the spine. But, in general, deficient nervous influence operates merely as a predisposing cause. Besides diminishing the vital powers of the part, it takes away that sensibility which is necessary for its protection from injury.

The tissue most disposed to mortification is the cellular, and next to it, tendinous and ligamentous structures, if the cellular tissue surrounding them have been destroyed; then bone, if deprived of its periosteum; next, the skin, especially if the subjacent cellular tissues have mortified or have become infiltrated with fluid; and, lastly, parts of higher organisation, as muscles, blood-vessels, and nerves, resist it most.

Like ulceration, mortification may either be preceded by inflammation or not. On the one hand, a part which has been injured may mortify through excess or perversion of the inflammatory and reparative processes, or exudations, which ensue; or, on the other hand, it may mortify slowly, and the mortification may spread slowly without there being energy enough in the system to set up inflammation.

SECTION II.—VARIETIES, SYMPTOMS, AND TREATMENT.

1. INFLAMMATORY MORTIFICATION.—*Symptoms.*—When inflammation is about to terminate in mortification, its redness gradually as-

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* Paget's Lectures, Med. Gaz., 1847, vol. iv. p. 1022.

sumes a darker tint, and becomes purple or blue; the heat, sensibility, and pain diminish; but the swelling often increases in consequence of the continued effusion of bloody serum, which not unfrequently exudes through the skin, and elevates the cuticle into blisters. If the *gangrene* proceed to *sphacelus*, the colour becomes dirty brown or black; the parts become soft, flaccid, and cold, and they crepitate when pressed, and emit a cadaverous odour from the gases that are evolved by incipient putrefaction. Whilst gangrene is spreading, the dark colour is diffused, and insensibly lost in the surrounding skin; but when its progress is arrested, a healthy circulation is re-established up to the very margin of the sphacelated portion, and a bright-red line of adhesive inflammation (called the *line of demarcation*) separates the living parts from the dead. And the appearance of this line is most important as a means of *prognosis*, because it shows that the mischief has ceased, and that there is a disposition to repair its ravages.

Separation of the Mortified Part.—It is at this bright-red line of demarcation that the dead part is separated by ulceration. A narrow white line, consisting of a narrow circular vesicle, and formed by a separation of the cuticle, first appears on it; and when this is broken, a chain of minute ulcers is seen under it. These gradually unite and form a chink, which widens and deepens till it reaches the bone; meanwhile the dead bone is cut off by a process to be hereafter described: thus the slough is entirely detached, and then a granulating and suppurating surface remains. In this manner the whole of a mortified

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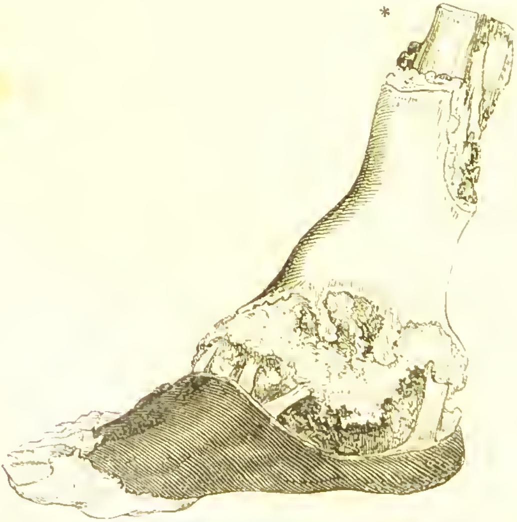

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* From a cast in the King's College Museum. The patient was a destitute girl, and the gangene arose from starvation.

limb may be spontaneously amputated; the bone and tendons separating higher up, and being more slowly detached than the skin, muscles, and blood-vessels. When the adhesive inflammation has duly occurred, this process of separation is unattended with hæmorrhage, the vessels being obliterated by the effusion of lymph and coagulation of the blood within them. And this coagulation extends some distance from the mortified part, so that a limb has been amputated in the thigh for mortification of the leg without the loss of any blood from the femoral artery. Sometimes, however, as in hospital gangrene, these processes of adhesion are deficient, and the blood is found fluid in the vessels, so that the separation of the slough is attended with severe hæmorrhage.

Constitutional Symptoms.—The constitutional symptoms of mortification vary with its cause. If it arise in a healthy subject, from acute inflammation which is still progressing, there will be inflammatory fever; but, on the other hand, if the mortification be very extensive—if the inflammation of the adjacent parts be unhealthy, with no disposition to form the line of demarcation, but, on the contrary, with a greater tendency to serous effusion—or if the mortified part be of great importance, as intestine or lung, the constitutional symptoms will be of a low typhoid cast; there will be great anxiety, hiccough, a jaundiced skin, a soft, or rapid thready, and jerking pulse, and frequently profuse perspiration of a cadaverous odour.

Diagnosis.—It is important not to mistake the lividity and vesications of bruises, especially when they accompany fractures, for gangrene. They may easily be distinguished by their sensibility and temperature, and by the fact that in gangrene the whole cuticle has lost its adhesion to the cutis, so that pressure will cause the vesicle to shift its place.

Treatment.—The general indications are, to allay inflammation if excessive, to support the strength, and to cause the formation of a line of healthy adhesion, by which the mortification may be arrested.

If gangrene occurs in a healthy, young, robust subject, with great pain, and a full, hard, strong pulse—and if it appears likely to spread from the violence of inflammation (of which the best example is sloughing of the penis from inflamed chancre)—it will be necessary to use bleeding, purging, and the general antiphlogistic treatment; whilst fomentations may be applied locally. But care must be taken never to reduce the strength, when a large part is so injured that its death is probable.

But an opposite treatment must be pursued if the pulse is quick and feeble, and if there are the other signs of deficient vital power that have been before mentioned. The principal remedies for this state are wine and opium—whose united effect should be to render the pulse slower and firmer, and to induce a warm, gentle perspiration and sleep,—whilst it will be a sign that they are injudiciously administered, if they induce or aggravate delirium and restlessness. Sir B. Brodie believes that brandy is by far the best stimulant, and that it is better to trust to it in urgent cases than to load the stomach with bark. Mr. Vincent agrees with him. Beef-tea, and other fluid nutriment, may be given with it. *Opium* is of prodigious utility from its power of allaying irritability; so that it renders the constitution insensible as it were to the local mischief—or, in Hunter's language, "It does good by not letting the disease do harm to the constitution." It may either be given in small doses frequently repeated, or, if there be at any time very great restlessness, especially towards night, it will be better to give a full dose at once; such as forty or fifty minims of the tincture, or two grains of the solid opium. The remedy next in importance is bark, of which the most efficacious preparations are the decoction of yellow bark, and Battley's liquor cinchonæ flavæ, the value of which the author learned many years since from Dr. Farre. It may be given every six hours, combined with nitric acid. Sir B. Brodie and Mr. Vincent believe that ammonia, if too long persevered in, depresses the vital energies. Their practical experience has confirmed the conclusions arrived at by those who have studied the properties of the blood, down to Dr. Richardson.—*Vide* F. 1, 2, 3, 4, &c.

Local Measures.—If a part be gangrenous, but not quite dead, its temperature must be maintained by warm poultices and fomentations.

If sphacelus has actually occurred, and the powers of the system are languid, and there is little disposition to form the line of demarcation, or throw off the dead parts, stimulating applications are necessary, especially the nitric-acid lotion, F. 119, on lint under the poultice;—the ung. resinæ, thinned with turpentine; ointment of creosote, or of Peruvian balsam, F. 163; tincture of benzoin; solution of the chlorides (F. 127);—or poultices of yeast (F. 155), or of stale beer-grounds. Any loose portions of slough may be cut away by scissors, taking care not to tear them away violently.

Incisions are of great service in spreading inflammatory mortification, attended with extensive effusion of serous or purulent fluids; which not only contaminate the blood, and depress the nervous system by being absorbed, but also propagate the disease by diffusing themselves along the cellular tissue, into parts that are still sound.

Question of Amputation.—The rule formerly given on this subject was, that we ought to wait till the gangrene is arrested, and a line of demarcation is formed, otherwise the stump may become gangrenous. And this rule still holds good in mortifications arising from constitutional causes; in that caused, for instance, by loss of blood or fever. But even after the line of demarcation has formed, it is necessary to take care that the patient has vigour enough to bear the loss of blood which must in some degree necessarily ensue. Sir A. Cooper mentions a case in which a mortified leg was separating favourably by itself through the calf, when the projecting bones were sawn off, with a view of expediting the process. A few granulations were accidentally wounded, and the trivial hæmorrhage that ensued was fatal.*

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* Lectures by Tyrrell, vol. i. p. 237.

But it will be proper to *amputate without waiting for the line of separation*, if the mortification be local as to its cause; as, for instance, in mortification of a limb from severe compound fracture or from injury or aneurism of the large arterial trunks. This practice is sanctioned by Larrey, Guthrie, Brodie, S. Cooper, Lawrence, Velpeau, James, and Porter of Dublin. We may add, that amputation seems to be justifiable as a last resource whenever there appears little or no disposition to limit gangrene, and whenever it spreads rapidly. "Where gangrene," says Mr. Guthrie, "is rapidly extending towards the trunk of the body, without any hope of its cessation, the operation is to be tried; for it has certainly succeeded, where death would in a few hours have ensued."*

II. MORTIFICATION FROM OBSTACLE TO THE RETURN OF VENOUS BLOOD.—This form of mortification mostly affects the lower extremities of persons who labour under dropsy from diseased heart, and it is always preceded by great œdema. It may occur without inflammation, or may be a consequence of inflammation, which if it attack œdematous parts is always liable to terminate in gangrene. In the former case, the skin of the œdematous limb, having become pale, smooth, glossy, and tense, assumes a mottled aspect of a dull red or purple colour, from distention of the subcutaneous veins. "Then at some part where the congestion is greatest, or where the skin is less yielding, as over the tibia, or above the malleoli, phlyctenæ or large bullæ, are formed by the effusion of serosity, either alone or mixed with blood, under the cuticle. When these burst, the cutis beneath presents a dark-red or brown colour, and very soon is converted into a dirty-yellow or ash-gray slough."† After the spread of the mortification to a given extent, inflammation occurs; and the slough, which is mostly an oval patch of skin and cellular tissue, separates.

Treatment.—The part should be placed in an elevated position, and numerous punctures should be made with a needle, to let the serum exude. The mortified part, and the ulcer that results, are to be treated by warm poultices of yeast, carrots, or stale beer-grounds, and stimulating dressings, of which the nitric-acid lotion is the best.

III. MORTIFICATION FROM PRESSURE, BED SORES, &c.—When a patient is confined to bed with some very tedious and debilitating malady, as a fever—and especially if he has not strength to shift his posture occasionally—the skin covering various projecting bony parts (as the sacrum, brim of the ilium, or great trochanter) is apt to inflame and rapidly ulcerate or slough; and more particularly if irritated by neglect of cleanliness or by the contact of urine. The first thing often complained of by the patient is a sense of pricking, as though there were crumbs of salt in the bed. The part, if examined at first, looks red and rough; then becomes excoriated and ulcerates, or turns black and mortifies. This accident is particularly liable to happen if the spinal cord has been injured.

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* Op. cit. p. 132; Velpeau, Lecture, in Lancet, 1848, vol. ii. p. 32.

† Carswell, Illustrations of Elementary Forms of Disease, Lond, 1837.

Treatment.—When long confinement to bed is expected, it is a good plan to apply some stimulant to the skin of the back and hips, to cause it to secrete a thicker cuticle, and enable it to bear pressure better. Nothing can be better for this purpose than brandy or eau de Cologne. If the part seems likely to suffer, it may be covered with a broad piece of calico spread with soap plaster; and small pillows, or macintosh cushions, or ox-bladders half filled with water, or water-cushions of vulcanised India-rubber, should be arranged so as to take off the weight from the part affected; and the patient should be made to shift his position often, or occasionally lie on his face. The soft poultice (F. 153) will be found of great service. After sloughing has commenced, the ung. resinæ or F. 163 is the best application.

IV. SENILE GANGRENE.—A form of *dry gangrene* affecting the fingers or toes.—*Symptoms.*—In one instance which came under the writer's observation, the patient, æt. 70, with diseased heart, complained for some time of numbness and pricking at the tips of his fingers. Next they looked bluish, and the cuticle peeled; then the surface of the skin black. But far more frequently it commences by a purple or black spot on one of the smaller toes; from which spot "the cuticle," says Pott, "is always found to be detached, and the skin under it to be of a dark-red colour." "In some few instances, there is little or no pain; but, in by far the majority, the patients feel great uneasiness through the whole foot or joint of the ankle, particularly in the night, even before these parts show any mark of distemper, or before there is any other than a small discoloured spot at the end of one of the little toes.'* Its progress in some cases is slow, in others rapid and horribly painful. After its first appearance, the actual gangrene will generally be preceded by a dark-red congestive inflammation. The dead parts become shrunk, dry, and hard; and when the disease makes a temporary pause, which it frequently does, they slowly slough away,—and the wound may heal; but a fresh accession of gangrene mostly supervenes before any progress has been made towards cicatrization. In this way the patient may live several winters, but often sinks exhausted with the nocturnal pain before the whole of the foot is destroyed.

Pathology.—This disease is supposed to be caused by degeneration and obstruction of the arteries. Hence the foot is imperfectly nourished; it is weak and liable to pain and numbness if heated after being cold; and a chilblain, or any other trivial source of inflammation, is sure to terminate in gangrene. A similar kind of gangrene sometimes attacks the skin of the leg.

This affection mostly happens to old persons of the better class, especially if they have been great eaters. They are generally found to have lost their hair and teeth, and their face and hands betray a languid circulation. It mostly attacks men. Mr. James,† however, has seen it in a woman of forty-two, who had disease of the heart; and Brodie in a man of thirty-six.

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* Pott's Chirurgical Works, 8vo. Lond. 1771.

† James on Inflammation, pp. 415 and 552.

Treatment.—It seems agreed now, that this disease should not be treated on a stimulating plan. If there should be any vivid inflammation and a good pulse the patient should be kept in bed; the bowels should be opened; the diet be restricted to fish and broth; and Dover's powder be given at bed-time, to allay pain. But should the health be feeble the diet must be more generous. The foot may be wrapped in lint, and covered with oiled silk. Brodie recommends a piece of calamine dressing to be laid on the part, and the whole limb to be loosely wrapped in repeated folds of cotton wool, and afterwards sewed up in a silk handkerchief. If there is much discharge this may be changed every second day; if not it may remain for a week. Amputation is inadmissible.*

V. WHITE GANGRENE OF THE SKIN.—In this curious affection, a circular portion of the skin, generally of the arm, becomes painful, and suddenly mortifies; becoming hard, white, and dry, and showing the red streak of the vessels with the blood dried up in them. It sometimes spreads by the gangrene of a circle of the surrounding skin. The cause is quite unknown, and the treatment must depend upon the circumstances of the case. The possibility that the disease may be caused by the application of some strong acid, for purposes of imposture, should be borne in mind.

CHAPTER XIII.

SECTION I.—SCROFULA AND TUBERCULOSIS IN GENERAL.

DEFINITION.—Scrofula, or *Struma*, is a state of constitutional debility, with a tendency to indolent inflammatory and ulcerative diseases.

Tuberculosis signifies that state of constitution in which there is a tendency to the deposit of a substance called *tubercle*, in various tissues and organs. Some pathologists, as Rokitansky, look upon it as identical with scrofula, or as the climax of it. Others, as Lebert, believe it to be an entirely distinct disease, which may affect the scrofulous by preference, but may attack others also. According to this school, all scrofulous persons are not tuberculous, and all tuberculous are not scrofulous.

DESCRIPTION.—There are two varieties of scrofulous habits, which, although they agree in the main essential of constitutional debility, are yet totally opposite in many respects. In the *first* (or *sanguine variety*), the skin is remarkably fair and thin, showing the blue veins through it, and presenting the most brilliant contrast of red and white; the eyes are light blue; the hair light or reddish, the forehead ample, and the intellect lively and precocious. Sometimes, however, as Mayo observes, the skin is *dark* and transparent, and the eyes dark, although there is the same general characteristic of delicacy and vivacity.*

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* Vide Sir B. Brodie's Lectures on Mortification, Med. Gaz. vol. xxvii., and Mayo's Pathology, p. 231; Syme's Contributions to the Pathology and Practice of Surgery, Edin. 1848, p. 5.

In the *second* (or *phlegmatic*) *variety*, the whole aspect is dull and unpromising; the skin thick and muddy; the hair dark and coarse; the eyes greenish or hazel, with dilated pupils; the belly tumid, and the disposition dull, heavy, and listless to outward appearance; although persons of this conformation will often be found to possess a clear, vigorous intellect, and powers of application far above the average. The great Dr. Johnson is an example.

In both varieties the natural functions are liable to be performed irregularly. Digestion is weak, the tongue often furred, and red on its tip and edges; the upper lip swelled, from a kind of turgescence of mucous membrane, whenever the health is worse than usual; the appetite sometimes deficient, but more usually excessive, and attended with a craving for indigestible substances; the mucous membrane of the throat and tonsils flabby; the bowels torpid; the blood thin and watery;—its coagulum soft and small; the muscles pale and flabby; and the heart and arteries, as well as the intestines, thin and weak.

In the sanguine variety, the growth is generally rapid, and the bodily conformation good, as far as outward form is concerned—the limbs well made, the stature tall, and the chest broad. In the phlegmatic variety, on the other hand, the growth is often stunted, the chest narrow, and the limbs deformed with rickets, and puberty retarded, especially in the females, who are liable to prolonged chlorosis.

Causes.—Scrofula being thus defined to be a peculiar state of the constitution, it may be shown, *first*, that it may be *congenital* and *hereditary*; that is to say, that scrofulous parents may transmit their peculiar organisation, and predisposition to disease, to their children. It is believed that syphilis of parents occasions scrofula in children, and that gin-drinking has a still more decided effect.

Secondly. The scrofulous habit, if not congenital, may probably be created by any circumstance capable, directly or indirectly, of lowering the vital energies; by poverty and wretchedness; meagre, watery, and insufficient food; neglect of exercise; insufficient clothing; neglect of cleanliness; habitual exposure to damp and cold, but most especially by want of fresh air and sunlight.

Thirdly. The scrofulous habit may be so intense, that the patient is attacked with some of the diseases that we shall presently describe, in spite of all care. Or, on the other hand, actual scrofulous disease may not appear unless the health is first depressed by some other disease, such as scarlatina, measles, the small-pox, or any other acute malady. Moreover, everything that disorders the digestive organs may bring it into action. It rarely breaks out before two or after thirty years of age: although it may be called into active operation at any age by circumstances which lower the health. The time of the second dentition and puberty are dangerous periods.

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* Vide Mayo's Philosophy of Living, 2nd ed. 1838; Carmichael's Essay on Scrofula, Lond. 1810; B. Phillips on Scrofula, Lond. 1846; Ancell on Tuberculosis, Lond. 1852; Latham's Lectures on Clin. Med.; Carswell, op. cit.; the works of Addison of Malvern; Wedl, op. cit.; Rokitansky, op. cit.; Hughes Bennett on Scrofula and Tuberculosis, ed. 1856; Lebert, Anatomie Pathologique, vol. i. 1857.

It is doubtful whether the English climate has more influence in causing it than any other. It is true that the natives of warm climates, who are brought here, are apt to suffer; and so are the birds and animals imported, and shut up in close dark cages; but these are special cases. One fact, however, is certain, that persons whose occupations cause them to be exposed to the weather at all hours and in all seasons, are not nearly so liable to scrofulous disease as others, whose occupations are sedentary, and carried on in close, hot, dark, ill-ventilated workshops. Pure air and sunlight often make amends for defects of food and clothing.

SCROFULOUS DISEASE.—When the scrofulous constitution has been created, and circumstances have occurred to elicit an outbreak of actual disease, a vast number of morbid processes may be set on foot, all of which are included under the term of scrofulous disease. Their general characteristics are, that they are excessively insidious in their approaches; seldom attended with acute pain, or with symptoms of sthenic inflammation; excessively obstinate; difficult to control by medicine; tending to the destruction of tissues by slow ulceration; and defective in the processes of repair. Such are the diseases spoken of in the next Section; besides scrofulous *otorrhœa; ophthalmia; ophthalmia tarsi; ozæna;* disease of *bones, joints, testicle,* and *mammary gland;* and convulsions and acute hydrocephalus during infancy.

TUBERCLE.—This is a peculiar substance, which is found usually in the form of roundish masses (whence the name *tubercle*), or else is infiltrated throughout the substance of various organs. So far as its naked-eye appearances are concerned it may be met with in the form—1st, of *miliary* tubercle; grayish, semitransparent, granular-looking bodies, varying in size from that of a pin's head to that of a small pea, and tolerably *firm.* 2nd, of *yellow* tubercle; of a dull yellow colour, and cheesy consistence.

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Microscopically considered, tubercle consists of molecular granules; of certain bodies called tubercle corpuscles; and of a structureless solid matter (corresponding to a solidified blastema) in which the other parts are contained. The so-called tubercle corpuscles are roundish, or oval, or irregular bodies, varying in size, but generally about half the size of pus globules; containing granules, and not exhibiting the reaction of pus with acetic acid.

The *nature* of the deposit is fibrinous exudation; and it seems that the early solidification of the blastema prevents the cells from attaining any degree of development; although the circumference of a tubercular deposit may display elongated fibro-plastic cells. If the lungs or any glandular organ be the part affected, there may be likewise a collection of ill-formed epithelium. Tubercle may involve old blood-vessels, but no new ones are developed within it.

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[*] Fig. 1 represents the microscopic elements of miliary tubercle from the lungs; 2, those of puriform fluid from softened fibrine; each consisting of imperfectly-developed cells.

Tubercle is thus incapable of development into tissue, but one of two other courses is open to it. 1. In favourable cases it may remain quiescent, and wither, and be partly absorbed, partly degenerate into a harmless mass of granular, oily, and earthy matter, which may remain till the end of life (*cretification*).

It may be remarked that there is scarcely any form of morbid growth which may not decay, and be converted into a yellow tubercular-looking, or putty-like mass, in which the atrophied elements of the tumour are combined with oil-globules and cholesterine. (See *Reticular Cancer.*)

2 In unfavourable cases it softens, beginning at its centre; the amorphous basis liquefies, so as to set free the granules and corpuscles; inflammatory infiltration takes place at the circumference, and pus is formed which is discharged by ulceration along with the softened tubercle. This process is too often attended with an increase of the tubercular deposit around, which rapidly undergoes the same destructive changes, until the organ affected be destroyed, and with it the life of the individual. This is *phthisis*.

Tubercle is usually deposited slowly, painlessly, and unsuspectedly during some period of defective health, and may remain in this condition for an indefinite time, till it wastes, if the health improves, and softens and causes abscess if the health is made worse. In some cases after this, by proper treatment, the deposit may be checked; in others it goes on with fatal rapidity.

The favourite seats of tubercle are the upper lobes of the lungs and the mucous membrane of the intestines in middle life, and the cervical glands in childhood, and the meninges.

General Treatment.—The general indications are to procure and maintain a healthy condition of the blood, and to protect the patient from depressing influences.

To describe at length the general treatment of scrofulous persons would be to write a treatise on general hygiène: we must content ourselves with hinting at the most important points.

(1.) The *diet* should be nutritious, digestible, and abundant, consisting, as a general rule, of meat twice a day, good bread, green vegetables, such as peas and the various kinds of cabbage, mealy potatoes, preparations of eggs and milk, and a sufficient quantity of beer or wine to promote digestion, without creating drowsiness or feverishness.*

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* The author begs to warn his junior readers against the old-womanish doctrine, that children ought not to have animal food until they have cut a certain number of teeth. On the contrary, he would state it as a positive rule, that if the teeth are unusually slow in appearing, broth and meat ought on that very account to be given, in order to compensate for the want of nutritive force on which the delay in teething depends.

(2.) The *clothing* should be warm, especially for the extremities, so as to keep up the cutaneous circulation, and prevent congestion in the chest or abdomen. Flannel should be worn next the skin, both in winter and summer: in the former for direct warmth; in the latter to neutralise any accidental changes of temperature.

(3.) Free *exercise* of the muscles and lungs in pure open air is indispensable. All over-exertion of the brain should be avoided. The moral faculties may be trained; self-control inculcated, a thing very necessary to patients who are as passionate and excitable as they are weak; the faculty of observing the objects and operations of Nature should be cultivated; the garden, the farm, and the hill-side should have as much attention as the schoolroom.

(4.) The best *residence* for the scrofulous is one that is warm, without being damp in the winter, cool and bracing in the summer, and in the autumn, the sea-side. That climate, *cæteris paribus*, will be the best, which admits of the greatest amount of exposure to the air. Hence, for the winter, Madeira, or the Cape, in the earlier stages; but it is far better not to send patients away from home and friends (as is too often the case) merely to die.

(5.) Abundance of *sunlight* should be sought, as well as purity of air, since it is indispensable for the production of healthy colour and composition of flesh and blood.

(6.) Daily *washing and friction* of the skin are as beneficial to the scrofulous as they are to every one else; and if the patient be precluded from taking exercise, friction is indispensable. Cold *sea-bathing* is in general so advantageous, that it has been deemed a specific. The best season is from the middle of August to the middle of November. The object in using the cold bath is to produce a *vigorous reaction*; consequently, before taking it, the nervous and circulating systems should be in some degree of excitement, and the skin should be warm, although not perspiring. At all events the person who bathes should not be exhausted by fatigue, nor in a cooling condition from perspiration. If the bather be strong, he may plunge into the open sea early in the morning on an empty stomach, not only with impunity, but with advantage; but the forenoon is the best time for a weakly child, when the air is become warm, and the system is invigorated with a breakfast. Bathing will be injurious if a short immersion renders the surface cold, numb, and pinched. Warm salt baths are very useful.

(7.) *Tonics.* – It follows from our definition of scrofula that the medicines most likely to be of service are those which tend to give a firmer, healthier composition to the flesh and blood. The first of these which deserves notice is the *cod-liver oil*, whose wonderful properties of checking emaciation are now happily well known. It may be given in any scrofulous disease, and in any case in which the patient is losing flesh, in as large quantities as the stomach can tolerate. The author recommends it to be given just as the patient is lying down in bed, as by this means all chance of nausea is prevented. The best is a pale or light yellow sweet oil, prepared at home or imported from

Newfoundland. Any other fish-oil that is not too rank; good chocolate, calf's-foot jelly, blancmange, isinglass, good pea or lentil soup, the essence of meat, F. 196; or a little rum and milk taken quite early, may occasionally be tried as extra nutritives.

Bark is of immense service when there is a great exhaustion from suppuration, or when ulcers spread rapidly. The decoction, or liq. cinchonæ flavæ (F. 1, 4), are the best forms.

Iron is sure to agree with pale, flabby children, provided their liver and bowels are kept in proper action. Bark should be given in large doses for a short time when the system seems exhausted; iron in small doses for a very long time, with occasional intervals of a week. Every preparation of it has its value, from the mild citrate, or potassio-tartrate, or acetate, the old-fashioned *vinum ferri*, and the aromatic mixture of the Dublin Pharmacopœia—to the more astringent and stimulating sulphate or sesqui-chloride, F. 10, 20. The sulphate of zinc, the nitro-muriatic and sulphuric acids, and various bitter substances, are also useful.

(8.) *Anti-strumous remedies.*—There are some medicines which have obtained repute from their supposed power of improving the condition of the blood: and possibly from their solvent power over morbid deposits. Such are iodine and its compounds with potassium or with iron; the liquor potassæ; lime-water; the combination of corrosive sublimate with tincture of bark; the chlorides of barium and of lime; the extract or decoction of walnut leaves. Of these remedies, the preparations of iodine have the greatest repute, F. 88-95.

Alkalis are often of great service in scrofula, by neutralising acrid secretions in the stomach and bowels. They are especially indicated if the patient complains of heartburn or great thirst, or if the tongue is very red, or if there is a sinking and craving for food soon after meals. F. 77.

Sarsaparilla, F. 84, 85, seems to improve the powers of nutrition generally, and may always be given in cachectic diseases for which there is no palpable cause.

(9.) *Purgatives* are often necessary to sweep away the refuse left by an imperfect digestion; and besides it is fair to believe that the tendency to local disease will be greatly increased by an impure state of the blood. In some cases the gentlest alteratives, F. 65, in others, mere aperients are required; whilst in the case of *active* strumous disease of skin or mucous membrane, of a congestive or ulcerative sort, with foul tongue, the greatest possible benefit is sometimes derivable from efficient doses of calomel with scammony; or of rhubarb and polychrest salt, F. 37, 38, 41. Of course we exclude cases in which a red tongue and relaxed state of bowels indicate a tendency to ulceration of the intestines, and in which soothing absorbent remedies, F. 79, are indicated.

(10.) *Anodynes.*—Pain, when violent, must be relieved by opium or other anodynes; and the extract of conium, in regular doses thrice a day, may be of service when there are intractable ulcers.

SECTION II.—PARTICULAR SCROFULOUS DISEASES.

I. THE SKIN is particularly liable to suffer from pustular and suppurative maladies; especially behind the ears, on the scalp, and about the mouth, nose, and eyelids. These eruptions are generally contagious.

Treatment.—The general health must be attended to, according to the foregoing rules, and the local disease be treated by the frequent use of soap and water, and the application of the ointment of oxide of zinc, or of white precipitate or nitrate of mercury, or the black wash. *Lupus*, a scrofulous ulceration of the skin of the face, is described in the chapter on ulcers.

II. SCROFULOUS ABSCESSES (besides those which are caused by diseased glands or bone) may occur under three forms. 1st. They may commence imperceptibly in the cellular tissue, either under the skin, or between the skin and bone, or in the deep intermuscular tissue, or in the neighbourhood of a joint, beginning with painless deposit of lymph, which after a time softens down. 2ndly. A circular piece of skin, of the size of a shilling or half-crown, with the tissue immediately beneath, may slowly inflame and swell, forming a hard, red tumour like a carbuncle, but painless. After a time it suppurates imperfectly, and it does not get well till the whole of the diseased part is destroyed by ulceration. 3rdly. A small hard tumour of unhealthy lymph may form in the cellular tissue, which after a time inflames, causes abscess, and then sloughs out.

III. DISEASE OF THE LYMPHATIC GLANDS, especially in the neck, is the commonest of scrofulous or tubercular maladies. It may begin with an acute attack of inflammation, or with an indolent and painless deposit. The enlarged glands may remain for years stationary or slowly enlarging, till at length, from local irritation or disorder of the health, they inflame, and chronic abscesses form between them and the skin. In some few cases, after the abscess is opened, it contracts and heals, the glands remaining nearly as before. But more generally all the skin covering the abscess becomes red and thin, and ulcerates, and the ulcer heals with an ugly puckered cicatrix, but not till the whole gland has wasted with suppuration. These swellings have been known to destroy life by compressing the tracheal or cervical vessels, or by bursting into them.

IV. SCROFULOUS ULCERS may be a result of the pustules and excoriations of the skin that have been spoken of; or they may be formed by the ulceration of glandular and other chronic abscesses; in which case they sometimes destroy extensive tracts of skin and cellular tissue, and may kill the patient by exhaustion, or render a limb rigid and useless if he recover. Or they may be attended with a hardened base, thick everted edges, a copious formation of pale granulations, and deposit of unhealthy lymph into the adjoining cellular tissue, which, with the granulations, is liable to fits of sloughing, preceded by severe pain.

Treatment.—The first and main point is to procure a radical improvement of the general health by the means already spoken of. The second is the consideration of how far these outward and superficial diseases may serve as outlets for tubercular exudations that otherwise might be deposited in the lungs. Hence the various means for repressing and exciting absorption of local deposits might be of doubtful benefit if employed to the neglect of other measures. But if proper constitutional remedies are adopted, it is quite justifiable to preserve the integrity of each individual part; and lotions of zinc or iodine, or chloride of ammonium, F. 118, poultices of the *ficus vesiculosus*, or mercurial plaster on leather, may be used. The objection to these remedies is, not that they are mischievous, but powerless. 3rdly. When suppuration occurs, the matter should be evacuated by a sufficiently large puncture or incision before the skin has become red and thin. 4thly. Indolent abscesses, some time after opening, may be treated with injections of iodine lotion, or of zinc or copper lotion. Ulcers may be treated locally on the principles laid down in the sections on weak and irritable ulcers. Poultices and emollients are seldom of service. The thin red skin overlapping the edges of an ulcer or abscess, which is inclined to heal, may be removed by a clean incision, or by a touch with iodine paint. Such are the chief points worthy of notice in the local treatment of scrofulous abscesses and ulcers. In some few cases an enlarged gland may be extirpated.

V. TABES MESENTERICA, or MARASMUS, consists in a tubercular disease of the mesenteric glands, and of the follicles of the intestines, precisely similar in its course and phenomena to the same disease in the cervical glands. The diseased intestines inflame, adhere together, and ulcerate, so that openings form between different convolutions; and on

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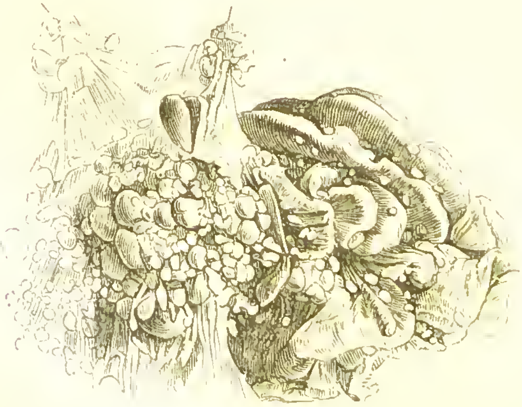

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* Represents enlargement of the mesenteric glands from a scrofulous patient.

examination the peritonæum is found as thick as leather, and the intestines resembling a collection of cells rather than a simple tube.

Symptoms.—Emaciation and voracity, owing to the obstructed course of the chyle; the belly swelled and hard; the skin dry and harsh; the eyes red; the tongue strawberry-coloured; the breath foul; the stools clay-coloured and offensive, sometimes costive, sometimes extremely relaxed. The patient of course dies hectic, although he often lasts wonderfully long.

Treatment.—Animal food and other nutriment given in small quantities at short intervals; mild mercurials to amend the intestinal secretions, especially the combination of corrosive sublimate with tincture of bark, F. 87; tepid salt bathing; stimulating liniments to the abdomen; change of air; and the cautious administration of the anti-scrofulous remedies before mentioned, especially the cod-liver oil.

CHAPTER XIV.

MORBID GROWTHS AND TUMOURS.

SECTION I.—OF TUMOURS GENERALLY.

DEFINITION.—By morbid growths are understood certain masses of living tissue, growing independently, excessively, and abnormally. The word tumour is used in pathological language to signify, not *any* kind of swelling or enlargement, but only such enlargements as are caused by morbid growths. Thus the enlargements caused by inflammatory swelling and exudation—by œdema, abscess, ecchymosis, and emphysema; by tubercular deposits; by the intrusion of hydatids or other foreign bodies; by the dilatation of organs, as in aneurism, or by their displacement, as in hernia—are not properly called tumours.

Thus in the definition of tumours are included the ideas—1st. That they are composed of a living tissue, either natural or unnatural, and if of natural tissue, yet developed in unnatural quantity or situation. 2ndly. That they grow independently, or, in Mr. Paget's words, "they grow with appearance of inherent power, irrespective of the growing or maintenance of the rest of the body, discordant from its normal type, and with no seeming purpose." Again—"while forming part of the body, and borrowing from it the apparatus and materials necessary to its life, the tumour grows, or maintains itself, or degenerates, according to peculiar laws."*

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* Vide Carswell's Pathology; Müller on Cancer and Morbid Growths, by C. West, Lond 1840; Walshe on Cancer, Lond. 1846; also on Adventitious Formations, in Todd's Cyclopædia, parts 30 and 31; Hughes Bennett, on Cancerous and Cancroid Growths, Edinburgh, 1849; Paget's Lectures, Lond. 1853; Lebert, Physiologie Pathologique, 1845; Traité Pratique des Maladies Cancéreuses, Paris, 1851; and Anatomie Pathologique, Paris, 1857; Wedl, Pathological Histology; Rokitansky, op. cit.

Tumours seem to originate in morbid states of the blood, which either cause exudation and new growth, as in cancer; or which cause preternatural growth of already existing structures, as in epithelioma. Each sort respectively depends, no doubt, on some specific constitutional vice. But the nature of that vice is quite unknown. The remedies are equally unknown; for there is scarcely any morbid growth that is influenced by any medicine yet discovered.

Classification. — The true basis of the classification of morbid growths is their structure; and the structure being known, both in its naked-eye and microscopical characters, the origin, development, symptoms, and subsequent history of each kind of growth must be attentively studied.

A large group of tumours are composed of fibrinous, or *fibro-plastic matter, in some stage of development* between indistinct fibrillation, or rudimentary cell-growth, and perfect fibrous or areolar tissue. This group includes the *fibro-plastic*, fibro-nucleated, and fibrinous and gelatinous tumours; which are composed of masses of cell-growth (see p. 23), which increase in bulk, without being developed into perfect tissue; and in which a great variety of abortive cell-forms is displayed. Many pathologists think that cancer and tubercle belong to this group. Besides these it includes the fibrous and fibro-cellular, in which the structure of areolar tissue is fully developed.

A second group consists of *bony and cartilaginous* tumours.

A third group is composed of new and independent development of *gland tissue*, more or less perfect.

A fourth of *blood-vessels.*

A fifth is distinguished by the presence of *cysts*, although this is an accidental circumstance in several instances.

A sixth consists in the local overgrowth of *fat tissue.*

A seventh consists in enormous production of *epithelium.*

An eighth, of black pigment.

A ninth is distinguished by certain peculiarities in its cell elements; and no less by its fatality. This is the group of *cancer.*

Formerly all tumours which had the fatality of cancer were considered to belong to a group apart, and called *malignant;* whilst the remainder were called *benign* or *innocent.*

1. Of the *benign*, it is assumed that they originate in a sort of local error of formation. That they are *homologous*, or *homœomorphous*, or in other words, identical with, some of the normal tissues of the body. That they may be continuous with normal tissues of the same sort, but circumscribed, discontinuous, and not infiltrated amongst a variety of other tissues. That there may be many in one individual, but usually in the same tissue. That they are perfectly compatible with a high state of health. That they have an uncertain period of increase, after which they may remain stationary for an indefinite time, or may undergo a process of fatty or earthy degeneration. That they may, by their bulk and situation, cause œdema or paralysis, or obstruction to various canals; or may inflame and suppurate; or may undergo ulceration or

sloughing, and so may seriously impair the health; but that all these ill consequences are local and accidental, and cease if the tumour be removed; and that if effectually removed, there is no return, either in the same, or in any other place.

2. Of the *malignant*, on the contrary, it is said that they possess the following marks: 1. They are of constitutional origin. 2. Their progress is generally rapid. 3. They progress constantly; 4, are attended with pain; 5, return if cut out; 6, are liable to be diffused over the body from increase of the *materies morbi*; or 7, are liable to *secondary deposits*, from being absorbed from one part and deposited in another; 8. they are attended with cachexia; 9, they resist all treatment; 10, they infiltrate every tissue in their vicinity; 11, soften inwardly; 12, ulcerate outwardly; 13, invade the lymphatic glands; 14, are heterologous in structure, that is, resemble no tissue naturally found in the body; and lastly, after a time prove fatal. The only tumour possessing all these marks is cancer.*

3. There is a third intermediate class, of *semi-malignant* or *cancroid* growths, including those which have some, but not all of the vital characteristics of cancerous growths; as well as those which (like the fibro-plastic) resemble cancer in their coarse appearances, though not in their real structure.

But in truth, there is no absolute line of demarcation between malignant and non-malignant growths. *All tumours are constitutional.* All are liable to return after extirpation. Some varieties of fibrous and fibro-plastic and cartilaginous tumours may not only return, if removed, but may invade many internal organs. There is no tumour which in some individuals, or under some circumstances, may not display at least ten out of the fifteen signs of *malignancy*. But for all this, it is absurd to erect the malignant into a separate class, from the innocent tumours of the same structure. It is like putting all the fatal cases of a disease into one class and the unfatal into another.

SECTION II.—THE FATTY TUMOUR.

THE FATTY TUMOUR (*Lipoma*) is *composed* of genuine fat-tissue; that is, of oil-cells, rounded or polygonal, packed in the meshes of a natural areolar tissue. Such tumours are contained in a fibrous capsule, in which their blood-vessels ramify, and which sends partitions throughout their substance, dividing them, more or less completely, into lobules.

In *outward characters* they are soft, painless, and lobulated; feeling just like fat.

Their most usual *situation* is the subcutaneous cellular tissue of the trunk, especially about the back of the neck and shoulders; but they may extend between and under fasciæ, deep amongst the muscles of the neck, trunk, or limbs. They may even be found in parts where no fat exists naturally, as the scrotum or eyelid; but, in such cases, probably began to grow higher up, and moved downwards afterwards.

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* See a paper on Cancer, by R. Druitt, Association Journal, Jan. 1854.

In number this tumour is generally single; its growth is slow; it may attain enormous bulk, even 70 lbs.; but causes no inconvenience, save what arises from its weight and situation; and is liable to no process of degeneration, except that it may possibly become inflamed and adherent, or hardened by the development of fibrous tissue, or even may ulcerate or slough out.

It may by its softness be mistaken for chronic abscess or encysted tumour; but the *tactus eruditus*, or puncture with a grooved needle, will distinguish the difference.

Treatment.—The liquor potassæ has considerable influence in causing the absorption of fat, when there is a universal tendency to obesity, or even when there is a partial overgrowth of fat in some part of the body; where it is an exaggeration of the whole fatty tissue of some region, and not a true circumscribed tumour. Sir B. Brodie has seen such local hypertrophies of fat in the neck more commonly than elsewhere, and gives a case of a servant, in whom such an overgrowth was aggravated by iodine, and cured by liquor potassæ. The dose is a fluid drachm, thrice daily in table-beer. But neither this nor any other medicine has any effect on the true fatty tumour.

Sometimes a fatty tumour on the cheek has been caused to waste in suppuration by means of a seton passed through it; but, for most cases, extirpation by the knife, after the manner described in the last Part, Chap. II., is the only remedy, and an effectual one; for this of all tumours is the least likely to return, although in rare instances it does so.

SECTION III. — THE FIBROUS, PAINFUL SUBCUTANEOUS, FIBRO-CELLULAR, FIBRO-PLASTIC, FIBRINOUS, FIBRO-NUCLEATED, AND COLLOID TUMOURS.

I. THE FIBROUS TUMOUR (*desmoid tumor*) is composed of fibrous tissue, identical with that which forms the normal tendinous structures of the body, and which it perfectly resembles in naked-eye appearances. In many tumours the fibres are arranged in bands or loops, or perhaps in concentric circles round numerous centres; in others they are inextricably matted together. Some are vascular and pinkish, but the majority almost destitute of blood-vessels. Microscopically they are seen to consist of fibrous tissue, which when rendered transparent by acetic acid, usually reveals numerous nuclei scattered amongst the fibres.

The most frequent *habitat* of these tumours is usually said to be the womb. But the so-called fibrous tumours of this part consist in reality of unstriped muscular fibre. Fibrous tumours are common in connexion with the periosteum, especially about the jaws, or may grow in the interior of bones; in the subcutaneous cellular tissue; in the breast, and particularly in the nerves, where they receive the name *neuroma*.

On examination these tumours are usually firm, free from tenderness, smooth, oval or pyriform; slightly lobulated; of slow growth; lasting any number of years, and attaining almost any size; generally single as to number, or, if multiple, affecting but one and the same organ.

Their origin is usually quite spontaneous, and cause unknown: sometimes they follow an injury; but even then the reason why is quite unknown.

Of the degenerations this tumour is subject to, the commonest is *calcification*, that is, infiltration with earthy salts, by which parts of it are converted into a stony mass. Cysts also, filled with serous fluid, may form in the interstices. Such a tumour may inflame, soften, suppurate, and slough out entirely or by degrees; or may adhere to the skin over it, and cause it to ulcerate by distension and slough, or may throw out livid bleeding fungous protrusions.

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Extirpation is the only *treatment*: after which the patient may be comforted with the probability that there will be no return of the disease in the same place, or elsewhere.

Yet, as we before said, cases occasionally happen in which a fibrous tumour has returned again and again, after apparently thorough extirpation, and has been excised five or more times, till at last a permanent cure has been obtained. In any such case of recurrence, early and free extirpation should be resorted to; and the iodide of potassium be administered. In other rare cases a fibrous tumour, after repeated extirpation has been succeeded by a cancerous growth; whilst in other still rarer cases, not only does the fibrous tumour return *in situ*, after excision, but the tendency becomes diffused, and the lungs or other internal organs are attacked.

II. The Painful Subcutaneous Tumour, of Wood, is a small body, rarely larger than a pea or coffee-berry, composed of fibrous tissue, situated under the skin, generally single, generally affecting women, subject to fits of most excruciating neuralgic pain, and often the cause of hysteric and other spasmodic affections. Hitherto, anatomists have failed to detect, on dissection, any connexion between these tumours and the nerves; so that a distinction must be drawn between them and the *neuromatous* tumours, which are generally multiple, affect men rather than women, and consist of small fibrous tumours embedded in the sheaths of nerves. Extirpation is the remedy.†

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* Section of "fibrous tumour" from the uterus, treated with acetic acid.

† See the paper by Mr. Wood, who first accurately described and named this tumour, in Edinburgh Med. Chir. Trans. vol. iii.; Lond. Med. Gaz. vol. vi. p. 59; Paget's Lectures; Wedl. op. cit. p. 400.

III. The FIBRO-CELLULAR TUMOUR is composed of the common areolar tissue of the body. On a section it displays bands of firm white fibrous tissue, intersecting a softer, yellow, gelatinous-looking substance, infiltrated with serum. Microscopically, the characters are those of fibrous and filamentous tissue, in a more or less complete state of development. The most frequent seats of this tumour are those in which the fatty tissue is not found: as "the scrotum, or labium, or the tissues by the side of the vagina, the deep-seated intermuscular spaces in the thigh, and the scalp." But the same tissue likewise constitutes, says Mr. Paget: "1st. Nearly all the softer kinds of polypi, such as the mucous or gelatinous polypi of the nose; and the polypi of the external auditory meatus. 2nd. The various cutaneous outgrowths, such as occur in the scrotum, labia, nymphæ, clitoris, and more rarely in other parts; and, as hardly to be defined away from these, the warty and condylomatous growths of skin; and 3rdly, the outgrowths of scars, the cheloid tumours as they are named." When occurring as distinct tumours, they are felt as soft, elastic, painless masses. Their growth is usually quick, though a sudden increase of size may be due to serous infiltration, rather than to increase of tissue. They may attain a very large size; may accidentally slough or ulcerate, but can be radically cured by excision.

IV. The FIBRO-PLASTIC TUMOUR, of Lebert (*sarcoma*), is composed apparently of plastic lymph permanently arrested in its development into areolar tissue. There are two varieties of naked-eye appearances which are often combined in the same specimen.

1. The soft variety has a great resemblance to encephaloma, being quite as soft, though more elastic, and not sorcadily torn; yielding, when cut, a clear serous, and not milky juice; and having altogether the character of flabby granulations, such as are found surrounding carious bones.

2. The harder variety, or real sarcoma, is of firm consistence, like that of muscle, or of *carnefied* lung, or rather of kidney; but not so firm as the fibrous tumour; on a section it appears homogeneous, and finely grained; its colour varies from reddish yellow to a deep fleshy red; these tints alternate in patches, and are mixed with spots of ecchymosis; it is often intermixed with fibrous bands, and contains many blood-vessels.

The microscopic elements of the fibro-plastic tumour are—1. Fibro-plastic cells, spherical or ovoid: with pale cell-wall, well-marked nucleus, and nucleolus in the form of a small dot. 2. Cells elongated into oat-shaped or pyriform bodies; pointed, or branched, and losing their nuclei. 3. Free nuclei, some elongated; and small globules. These elements are depicted at page 23. 4. Mother-cells; large oval bodies from ·001 to ·003 inch, enclosing from two to ten or twelve fibro-plastic nuclei. These cells are called *myeloid* by Paget, from their resemblance to cells found in the marrow of fœtal bones; and the tumours in which they are formed he also calls *myeloid*. 5. Fibrillary matter, more or less perfectly developed into tissue, inclosing the cellular elements; sometimes very scanty, sometimes abundant, soft, and gelatinous (*fibro-gelatinous*, or *fibro-colloid tumour*). 6. Well-developed areolar tissue enveloping the tumour, and forming boundaries to its various lobules.

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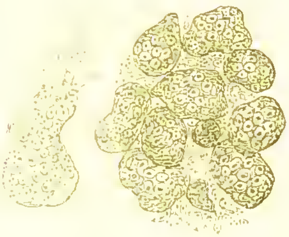

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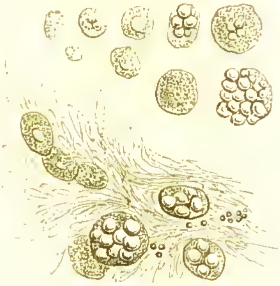

In external characters, fibro-plastic tumours are usually smooth, lobulated, and globular. They may be situated in the skin; in the subcutaneous, or submucous, areolar tissue; deep amongst the muscles (especially of the thigh), in or upon bone, especially the maxillæ; or on the dura mater; or in the mamma, or other secreting glands, or in the lymphatic glands. They generally, but not always, grow slowly; they may attain enormous size; may undergo calcification; or may inflame and ulcerate, or slough, and so prove fatal. They usually are single; may occur at any age; they sometimes seem to arise from a syphilitic taint. As regards origin, some seem to follow an obscure inflammation, which has produced exudation into a lymphatic gland, or the testis. Others are of independent spontaneous or unknown origin. If extirpated they are exceedingly apt (much more so than the fibrous tumour) to return in the cicatrix, but very rarely in any other part; yet they may do so, or may be *diffused* over the system in the same manner that cancer is. The tumours most likely to become thus *malignant* are those of spontaneous origin, which yield most varieties of embryonic cell-forms. Fibro-plastic elements are also found in abundance in glandular, and most other rapidly-growing tumours. The *treatment* consists in extirpation, repeated if the disease returns; and the prolonged use of iodide of potassium. In rare instances these tumours have been known to disappear spontaneously.

V. The FIBRO-NUCLEATED TUMOUR, of Hughes Bennett, is a tumour composed of filaments infiltrated with abundance of naked nuclei. In outward appearance it may resemble the fibrous,

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* Myeloid cells from a fibro-plastic tumour of the upper jaw, removed by Mr. W. Fergusson, 24th Nov. 1855. In colour and consistence it exactly resembled human kidney.

† Imperfect areolar tissue, and large cells containing fat globules from a fibro-gelatinous tumour of the calf of the leg, drawn from nature. See a description of the same tumour, Pathological Trans., vol. v. plate xvii.

‡ Fibro-nucleated tumour. From an ass.

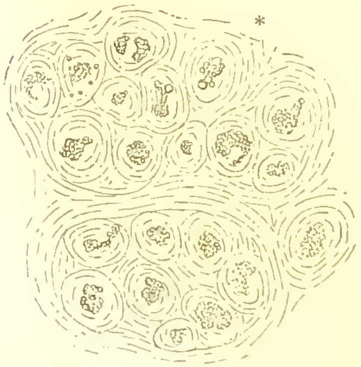
or fibro-plastic tumour, or cancer; but microscopically examined the presence of nuclei, instead of cells or fibres, distinguishes it from the former two growths, and the absence of cancer cells from the last. Its clinical history is, so far as is known at present, almost identical with that of the former tumours.

VI. The FIBRINOUS TUMOUR is composed of almost structureless decolorised blood-clot, and is the result of extravasation of blood. It forms a soft tumour, and may generally be distinguished by its history and by its sudden origin.

VII. COLLOID, or GELATINIFORM MATTER is a substance closely resembling glue, or jelly, of various degrees of firmness and transparency; and is often found in cysts in the thyroid gland, and in the ovaries and prostate. The writer has several times found it in the substance of fibro-cellular tumours; and it may be found amidst the products of chronic inflammation of the pleura and peritonæum. Moreover, a glue-like matter is a characteristic of one form of cancer. (See *Colloid Cancer*.)

SECTION IV.—CARTILAGINOUS AND OSSEOUS TUMOURS.

I. The ENCHONDROMA, or cartilaginous tumour, consists of round masses of cartilage, embedded in fibrous membrane. It may be of various degrees of firmness; almost as soft as the vitreous humour, so soft as to be mistaken and punctured for ganglion, or as firm as ordinary cartilage. It consists microscopically of cartilage cells embedded in an intercellular hyaline substance; but there are very many varieties, not only in the quantity, consistence, and transparency of the intercellular substance, but also in the number and arrangement and size of the cells, and of the nuclei. Generally speaking, the cells are numerous, and loosely connected to the hyaline substance. They are round or oval; from $\frac{1}{700}$ to $\frac{1}{1500}$ inch in breadth; and the cell-wall may be completely distinct from, or inseparably blended with, the intercellular substance. The nuclei are single, sometimes double; round, or oval; rendered paler by acetic acid; with one or two nucleoli; some shrivelled or full of oil-granules; some throwing out projections, like those of cartilage in process of ossification.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Chemically it consists for the most part of phosphate of lime, and of a peculiar variety of gelatine, called *chondrine*, which is extracted by boiling in water from the temporary cartilage of the fœtus, and from the permanent cartilage of the adult, but not from the adult bone or tendon. It differs from common gelatine, in containing less oxygen, and in being precipitable by alum, acetate of lead, and sulphate of iron.

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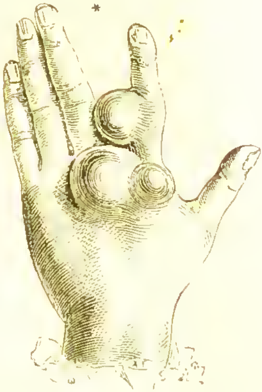
* Microscopic characters of enchondroma. Nuclei granular.



In external character, cartilaginous tumours are firm and smooth, usually somewhat nodulated, sometimes hard, sometimes so soft as to be mistaken for cysts. Their usual situation is on or within the bones, particularly those of the hands; and they may be developed either within the bones, which they then cause to expand into a thin shell, or else from their surface beneath the periosteum; in which case they usually have, like other tumours in the same situation, a skeleton of light papery plates, and spicula of bone shooting throughout their substance, as represented in the next cut. Or they may become ossified, from internal independent centres of ossification.

But besides the bones, enchondroma may form in the glands, as the testicle, mammary, and particularly the parotid. It may form isolated moveable tumours in the subcutaneous tissue, and may be found in the lungs. It may likewise be combined with the fibrous, fibro-plastic, colloid, or cystic growths, or with cancer.

The growth of cartilaginous tumours is usually slow; but this is subject to great variety.

Thus, in one case, related by Mr. Frogley, a tumour of this sort, growing upon the femur, attained the circumference of three feet in five years; another, twenty inches in eleven years; another, mentioned by Mr. Paget, acquired the circumference of a man's chest in three months from the time when it was first noticed. The articular surfaces in the neighbourhood are not affected, nor is there any adhesion, or infiltration of other tissues. But, after an uncertain time, the cartilaginous tumour may undergo fatty or earthy degeneration, as in the case of a small nodule the size of a walnut, removed by Mr. Walton from the subcutaneous tissue of the forehead, in which the writer found half the tumour degenerated into a yellow, cheesy mass. Moreover, the hyaline substance may soften down into a stuff like pease soup, as in another specimen from the vicinity of the parotid which Mr. Walton sent to the author, and which was converted into a mass of cysts, with fresh lobules of cartilage growing into them. Such cysts may ulcerate and discharge their contents, giving rise to great constitutional irritation and exhaustion.

Cartilaginous tumours are more frequent in early life. They are often multiple and hereditary; and although, as a general rule, they do not return when thoroughly excised, yet to this rule there are many

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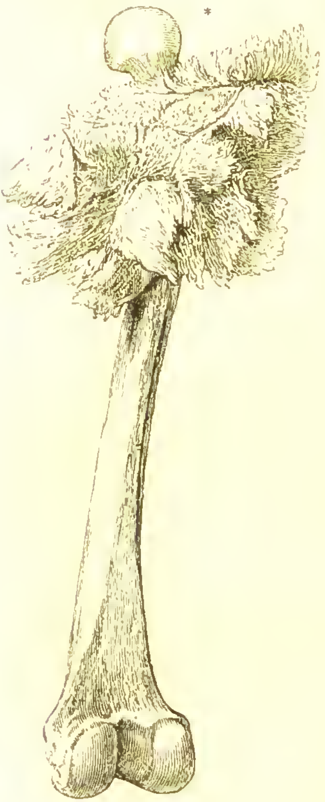
* Enchondroma of the hand.

exceptions. A case is narrated by Mr. Paget, in which a cartilaginous growth extended along the lymphatics from the testicle, to the vena cava inferior, and into the cavity of that vein: masses of cartilage were also found in the lungs.[†]



II. OSSEOUS TUMOURS are so constantly found in connection with the bones, that it will save repetition if we refer our readers for an account of them to the Chapter on the Bones. But we must say here, 1, that a distinction is to be drawn between tumours containing true *bone-tissue*, and others which are merely *calcified* or impregnated with amorphous earthy salts. 2. That some osseous tumours are formed by the hypertrophy of existing bones; and 3, others by the ossification of pre-existing fibrous, fibro-plastic, or cartilaginous tumours. When these are attached to the bones, they constitute *exostoses:* but true bony tumours, formed by the ossification of the other kinds, may exist isolated in the soft parts.

The term *osteosarcoma* was formerly used to signify any tumour in which bone was mingled with softer tissue; as, for example, the enchondroma, or fibrous tumour, when ossifying, and cancerous growths springing from the surface of bone.

SECTION V.—GLANDULAR AND VASCULAR TUMOURS.

I. GLANDULAR TUMOURS are formed by the development of a tissue resembling that of secreting glands. Such tumours are most common in the female breast, where they are known by the terms *chronic mammary tumour*, and *imperfect glandular hypertrophy:* but they may also be found in the lip, and in the prostate, parotid, and thyroid glands. Such tumours are generally painless, not tender, moderately soft, elastic, and lobulated. On examination they are usually found to consist of three elements: 1. Common fibrous tissue, hypertrophied.

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[*] Bony skeleton of enchondroma.

[†] Müller on Cancer, &c., translated by West, Lond. 1840; Lebert, Phys. Path. vol. ii.; Paget, Lectures, Med. Gaz. 1851; Frogley, Med. Chir. Trans. vol. xxvi; Paget, *ib.* vol. xxxix.

forming septa and loculi. 2. Abundance of fibro-plastic cells and nuclei. 3. Imbedded in the former two is found the essential constituent, *gland-tissue*. This consists of sacs, or pouches of clear pellucid membrane, arranged in lobules or *acini*, and filled with glandular epithelium. If the containing membrane be ruptured, the epithelium may be seen to pour out. Both the fibro-plastic and epithelial elements in these tumours are liable to softening from inflammatory disturbance, or from fatty degeneration. This disease may disappear spontaneously; or it may remain stationary; or it may enlarge, distend the skin, ulcerate, protrude as a bleeding fungous mass, and destroy life by irritation and exhaustion. It is sometimes traceable to local injury, or disorder of the health, but more frequently not. The iodides of potassium and of iron sometimes seem to delay the growth of this tumour; but in general it requires extirpation. Even then it is exceedingly liable to return: and cases are on record of five or six successive operations on the same patient, followed by renewed growth of the tumour.[†]

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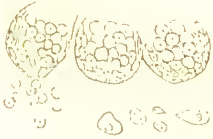

II. VASCULAR TUMOURS are composed of blood-vessels or of spaces containing blood, and will be more conveniently described in the Chapter on the Arteries.

SECTION VI.—CYSTIC TUMOURS.

These are tumours consisting of a sac, containing solid or liquid substances. They may arise in three ways: 1. By the formation of definite cavities in the meshes of the common areolar tissue. 2. By the dilatation and growth of obstructed gland ducts or follicles. 3. By the independent and erratic development of nucleated cells, which become exaggerated into cysts; or of isolated particles of gland-tissue, which fill with secretion, but are unprovided with ducts. 4. By the extravasation of blood, and the disappearance of the red particles, and separation of the serum from the fibrine.

I. SEROUS CYSTS.—Of the simple cysts, the most common are those containing serum. They may occur in almost any structure, natural or morbid: in the intermuscular areolar tissue; in bone; in tumours of almost every kind; in the secreting glands, as the kidney and breast; but most frequently in the neck in connexion with, or in the neighbourhood of, the thyroid gland; also in the vicinity of the jaws. The cyst itself is composed of fibrous tissue, and is often lined with epithelium. The contained fluid may be serum, pale or yellow, or tinged with bile or blood, or perhaps ropy or honey-like, and containing abundance of crystals of cholesterine. Or, lastly, it may be *colloid* matter, yellow stuff of the consistence of the vitreous humour, or of half-melted calf's foot jelly.

II. SANGUINEOUS CYSTS, containing fluid blood, are most common in the neck. They probably arise from the partial obliteration of nævi, of which these cysts, formed of distended veins, are the remains. *Treatment.*—This, and the preceding kind, sometimes heal and collapse after simple puncture, sometimes they require to be dissected out.

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[*] Three acini, from a glandular tumour of the breast; one ruptured, with epithelium coming out. Sketched from nature.

[†] See M. Charles Robin on Heteradénic Tumours in the Nasal Fossæ, &c.; Lebert, Anat. Path., Paris, 1857, vol. i.

III. SYNOVIAL CYSTS, or GANGLIA. See Part IV., Chap. III.

IV. GLAND CYSTS are formed by the obstruction of *excretory ducts*, or *follicles* of *glands*, or by the abnormal development of portions of glands without ducts. Under this extensive division we may include cutaneous cysts, or *wens;* which are formed by the obstruction, or by the misplaced development of follicles, whose inner surface secretes cuticle and sebaecous matter, with, perhaps, hair; and such cysts are found, not only under the skin, and in the ovaries, but in the skull, the chest, and many other parts. Teeth (which, it will be remembered, are parts of the dermal, or exo-skeleton) are also found in these cysts in the ovaries, as well as in cysts attached to the jaws. Cysts in the vicinity of the testicle, containing spermatic filaments, or in the breast, containing milk; the cysts formed in mucous membranes, and ranula, may be classed under this head. The contents of these cysts, which at first may be presumed to be identical with the natural secretions of the parts in which they are formed, become greatly altered by time. Solid curdy masses; viscid honey-like fluid; or colourless pellucid mucus, are found in different instances.

V. COMPOUND CYSTIC TUMOURS; such as occur in the ovaries, and in the villi of the chorion; formed, by the exaggerated development into cysts, of the cells of which these structures mainly consist.

VI. PROLIFEROUS CYSTIC TUMOURS (*Sero-cystic Sarcoma*) are composed of cysts, having solid fibro-plastic or glandular growths projecting into them. (See the Chapter on the *Female Breast.*) They may originate in two modes,—either as tumours, in which cysts are afterwards developed; or as cysts, to which the solid growth is superadded afterwards. In either case, the history may be divided into three stages. —First, there is the formation of cysts, possibly single; usually very numerous. Secondly, there is the growth into the cysts, from some part of their walls, of vascular tumours, composed of fibro-plastic cells, or else of rudimentary gland structure. The intracystic growths in either case enlarge and fill the cavities; and then the third stage arrives, in which the growths, having filled the cysts, burst through, enlarge, distend the skin, cause it to ulcerate, and then protrude through it in the form of bleeding fungous granulations.

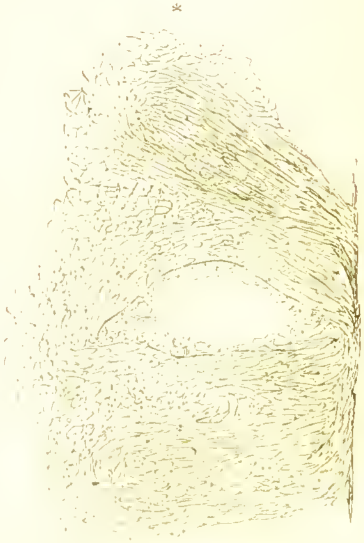
The most frequent seats of this disease are the mammary and thyroid glands; but it has been found in the lip, the prostate gland, and in the intermuscular tissue. The diagnosis and treatment will be more fully spoken of in the Chapter on Diseases of the Breast. Suffice it to say here, that the disease, although generally incurable, save by extirpation, and although liable to return *in situ* after extirpation, yet has no tendency to contaminate the lymphatic glands, or to be diffused over various distant organs, like cancer.

VII. FIBRO-CYSTIC TUMOURS are fibrous, fibroid, or fibrinous tumours containing cysts, probably from extravasation of blood.

SECTION VII.—EPITHELIOMA.

DEFINITION.—A disease consisting first in abnormal development of the epithelium, and probably of the villi or papillæ of skin or mucous membrane; then in ulceration; and then in *infiltration* of the deeper tissues and lymphatic glands with epithelium.

SYMPTOMS.—It may begin in the form of hypertrophy of the *epidermis* or *epithelium*: there being a softish itching vascular spot, from which cuticle is frequently desquamating; or a patch covered with a dry crust or scab. 2. There may be combined with this, a hypertrophy of the *papillæ* in some one of the multiform shapes of warts or excrescences; either sprouting, prominent, and cauliflower-like, with narrow elongated neck, or broad, flat, and low. 3. The *cutis vera* may be the part first affected; being thickened and forming a broad, oblong hard swelling, with a slight scab, or perhaps a crack on its surface; but whether affected or not at first, it is sure to be involved as the disease extends. 4. The subcutaneous tissue, or even the lymphatic glands or bones, may be, in rare instances, the parts first affected.



Anatomical Characters.—On examining a section of the diseased tissue, there is distinguished first, on the surface, a layer of thickened epidermis; mixed, perhaps, with pus and scabs; it is generally opaque yellow, cheesy and brittle, and easily scraped off. 2. Next to this are noticed the papillæ, hypertrophied in various degrees, and imbedded in the exuberant epidermis around them. 3. Under this is the true skin, thickened into a tough brawny mass, composed of a fibrous basis interspersed with numerous spots and streaks of opaque yellow, or brown. 4. If the subcutaneous tissues are involved, they present the same character.

Microscopical examination shows, 1, the epidermic layer to be composed of epithelium, arranged in concentric layers around and between the papillæ. 2. The papillæ and dermis are composed of white, intermingled with yellow fibrous tissue, everywhere abundantly infiltrated with epithelium cells, and with their nuclei and fibro-plastic matter. In the papillæ the epithelium is seen to be arranged symmetrically in concentric layers amongst the scanty fibrous elements; and this arrangement may penetrate to some depth within the cutis, from which elongated and imbricated rolls of epithelium, somewhat resembling the heads of young asparagus, can be extricated. 3. Within the cutis and subjacent tissue, the epithelium is found sometimes in concentric pellets, like the *comedones* or *grubs*, or inspissated contents of sebaceous follicles; sometimes in rings formed within obstructed ducts or follicles, but usually in large irregular quantities infiltrated amongst the fibres of the cutis and of the subcutaneous areolar tissue.

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* Section of three papillæ; the middle one split. Sketched from nature. About 100 diameters.

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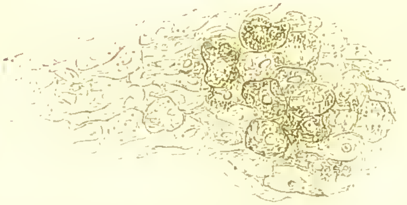

The epithelial cells vary much in size, *although their nuclei do not:* they may be round, elongated or spurred, wrinkled, split into fibres; they may be infiltrated with oil-globules; dried up; or softened into an almost amorphous granular mass mixed with oil and cholesterine, which to the naked eye resembles tubercle. Generally speaking, the larger the cell, the less perfect the nucleus. Some cells have double nuclei, or some nuclei double nucleoli, but not often.

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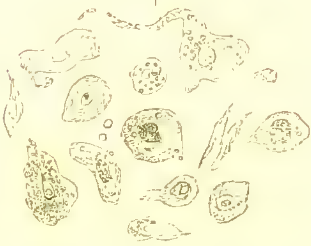

Epithelial tumours usually exude from a cut surface a copious, clear, serous juice, in which may be observed floating masses of epithelium cells, nuclei, and, perhaps, oil-globules and cholesterine. The diagnosis of this disease from cancer is spoken of in the last section.

The *Clinical history* of this disease is this. First, there may be a period of quiescence; the tumour remaining as an innocent wart for weeks or years. But if it once begins to ulcerate, its course is one of constant progress. The skin and subcutaneous tissues become more deeply and widely infiltrated, and consequently hardened and adherent; the nearest lymphatic ganglia enlarge and become the seats of similar deposit; and muscle, bone, and every other adjacent tissue, is attacked. But whilst the deeper parts are enlarging, the surface becomes the seat of foul and extensive ulceration. It cracks and oozes a purulent or sanious fluid, which, mixing with the epidermis, dries into a scab. When this is detached, a wide ulcer is brought into view; and at last there is formed a deep irregular excavation in the centre, exuding a thin ichor, surrounded by fungous warty growths, and resting on a base of hard adherent and infiltrated skin. Thus the entire lower lip may be destroyed; or the bladder, rectum, and vagina of the female may be converted into one huge cloaca. If excision be performed, the nearest lymphatic ganglia enlarge, and form a foul ulcer like the original. The constitution may be apparently sound at first, and may continue so, till it begins to be worn by the incessant discharge, the pain and irritation of the ulcerated surfaces, the absorption of fetid matter, and the interruption to various functions which ensues, especially if the disease be situated near the mouth, the anus, or the genito-urinary apparatus. In singularly rare instances, secondary epithelial deposits have been found in the liver, lungs, and heart.

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* A representation of a papilla, or the apex of a granulation, found in the urine, in the case of epithelioma of the bladder. Internally it contained a loop of vessels; outwardly it was clothed with scales of exuberant epithelium. About 200 diameters.

† Epithelial cells infiltrating the deep tissues of the lip, near a so-called *cancer* of the lip.

Causes.—Men are more subject to this disease than women, and it is rare before 40;—but of its predisposing and exciting causes little more is known than may be summed up in three statements; viz.—1st, in some few instances, hereditary predisposition may fairly be assumed; inasmuch as, in $\frac{8}{160}$ instances, Mr. Paget found that other members of the patient's family had suffered from this disease or from cancer; and this number, as Mr. Paget observes, although small, is too large to be referred to chance. 2. Constantly repeated local irritation seems to have some small share in producing this disease; it is generally believed that the smoking of short pipes is a cause of epithelioma of the lip, and that phymosis causes, or at least predisposes to, it within the prepuce. When it attacks the trunk or limbs, it is almost always at the site of some old scar, or ulcer. The frequency of the so-called chimney-sweepers' cancer of the scrotum in England, and the liability of chimney-sweepers to dry harsh warts, and to epithelioma on other parts besides the scrotum, are remarkable. 3. The existence of any simple wart or mole seems to be a sort of predisposing cause; hence, whenever any such tumour exists, it should be carefully guarded from irritation, and if it begins to swell or be troublesome it should be entirely excised or destroyed.

The parts most frequently affected are the lower lip, tongue, penis, scrotum, and vulva; the back of the hand or foot; and, amongst internal organs, the os uteri and larynx, and bladder. The warty growths from old scars, particularly on the lower extremities, are instances of the same disease. The malady is far more liable to return after excision, and is more rapidly and certainly fatal on the lip, tongue, or penis, than on the trunk or limbs.

It will be seen that *phagedænic* epithelioma has close affinities with cancer, in its tendency to spread; to invade and infiltrate all tissues successively; to affect the lymphatics; and to return after excision. It differs, inasmuch as it is more capable of being excited by external causes; not attended with so early or obvious derangement of the health; more curable by excision; homologous in its elements, and not liable, except in the rarest possible instances, to be diffused over distant organs.

Treatment.—The only measure worth speaking of is very early and free extirpation by the knife, followed by repeated and wide excision of any part whatever within the sphere of the malady, if it returns; or by destruction with caustic after the manner described under the head of *Lupus* and *Cancer.* And extirpation is still to be advocated even in cases where the disease has made great progress, and where the lymphatics are affected, because although it must be confessed that the disease is almost sure to return, and ultimately to prove fatal, yet it removes, though but for a time, a disgusting and irritating ulcer, which preys on the patient's spirits, and exhausts his vital powers. In other respects, the general and local treatment is that of cancer.[*]

SECTION VIII.—MELANOSIS.

DEFINITION.—The word *melanosis* has been applied indiscriminately to tumours containing notable quantities of black pigment.

Pigment is a thing of frequent occurrence in the animal body. In some animals it appears earlier than blood or vessels; and it may be of different composition and properties in different cases. But it is usually found in the form of the minutest sepia-coloured granules, such as give the colour to the choroid coat of the eye, and to the skin in dark persons, and the lungs of the aged. These granules may be free, or collected into masses, with a cell-membrane around them; or may be added to any morbid growth whatever. The chemical composition is not settled; but pigment from the lungs has been stated to contain from 80 to 90 per cent. of carbon; to resist sulphuric acid; and to be converted by the nitric acid, and by chlorine into a brown substance resembling ulmine.

[†]

The surgical relations of pigment are these,—1st. It is often to be met with in *degenerating growths* of any kind. 2ndly, It is of frequent occurrence in those small patches of hypertrophied skin called *moles.* 3rdly, It is often abundant in *cancer;* so much so as to constitute a variety, called melanotic, or black cancer. 4thly, There is a *melanic diathesis* in which large quantities of pigment may be deposited or infiltrated through many organs in the same individual, either alone or in conjunction with fibrous or fibro-plastic elements. This is a very common malady in old bay and gray horses. But although these tumours may pervade the entire body, and occasionally soften, they have no other signs of malignity. See *Melanic Cancer.*

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[*] For a full account of this disease, consult Hannover, das Epithelioma, &c. Leipzig, 1852.

[†] This cut represents a portion of a very tough fibrous tumour, loaded with pigment, from an old bay pony of Professor Simmonds, of the Royal Veterinary College. The author begs to express his acknowledgments to Professor Simmonds for many opportunities of studying morbid growths in the lower animals.

SECTION IX.—CANCER.

DEFINITION.—Cancer is a disease, evidenced by the development of peculiar cells, called cancer cells, or of their nuclei. These, combined with a liquid, or semi-liquid substance, called the cancerous juice, and contained either in a *stroma* of new fibrous tissue, or in the interstices of some other already-existing tissue, constitute a cancerous growth. The common characters of all cancerous growths, are the fifteen characters of malignancy which we have given at page 95.

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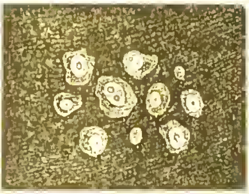

CANCER CELLS.—These, which form the specific element of cancer, are, in their best examples, regular spheres, about $\frac{1}{1000}$ inch in diameter, with an oval excentric nucleus, occupying the half or more of the interior, and containing one or more large nucleoli. The outline of the cell is pale and fine—that of the nucleus, bold and well marked; the contents of the cell finely granular. Acetic acid renders the cell pale and transparent, and the nucleus more distinct.

But from the typical form there are many variations,—for the cancer cell may vary in size from the $\frac{1}{700}$ to the $\frac{1}{2500}$ of an inch; in shape it may be ovoid, triangular, fusiform, or elongated into one or more spurs, exhibiting a much greater variety of form than any other known cell; there may be large mother-cells, containing three or more nuclei or perhaps small complete cells; or there may be nuclei in abundance, which have not yet had a cell-wall developed upon them, together with abundance of molecules and granules.

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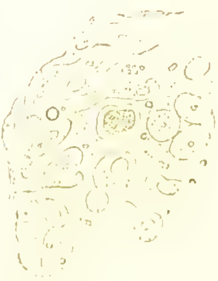

Cancer cells may deviate from the common type,—1st, through want of development; hence the smallest and least complete cells are found in the quickest growing cancers of the *soft* variety, and it may be very difficult to distinguish these from fibro-plastic cells. It may be affirmed that small old slowly-growing hard cancers, yield the most perfect, and large rapidly-growing soft cancers the worst developed specimens of cell. 2ndly, Cancer cells present other varieties depending on degeneration and oily infiltration; for cancer, like all other tumours, may decay into a yellow-cheesy tubercle-looking mass. This was described by Müller as a distinct variety under the name *reticular cancer*.

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* Cancer cells traced by the author with the camera; magnified 200 diameters. *a*, nuclei; scale of ·001 inch.

† Typical Cancer cells and nuclei from nature.

‡ Mother-cells, and other varieties of cancer cell, drawn by Dr. Lionel Beale.

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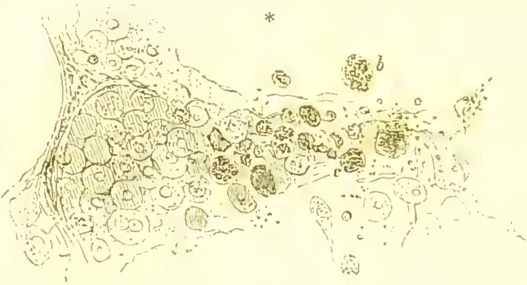

The *cancerous juice* which may be squeezed from the freshly-cut surface of every cancer, and should be taken up for examination without scraping, is a rather milky liquid, which mixes readily with water into an emulsion.

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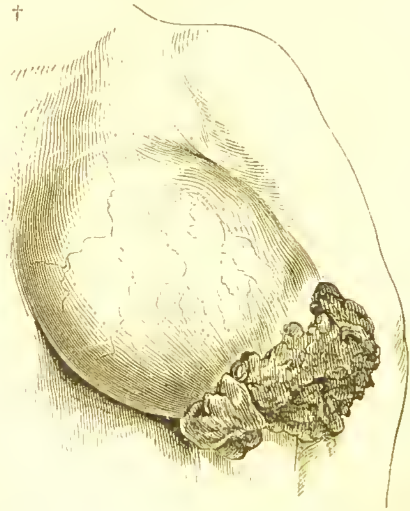

The *stroma*, or framework of cancer, may either be the natural fibrous, or glandular, or other tissue, or else a new fibrous tissue, of varying degrees of firmness, and intermixed in rapidly-growing tumours, with fusiform cells, and other common fibro-plastic elements. Neither nerves nor lymphatics have been found in cancer.

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* Cancer cells in their stroma. *b*, some cells loaded with oil, others with melanotic pigment. Drawn by Dr. Lionel Beale.

† Soft Cancer of the Breast.

Varieties of Cancer.—1. The type and model of cancer is that which is commonly called *soft cancer*, *encephaloma*, or *fungus medullaris*; and which is characterised by very great abundance of cells, contained in the meshes of a most delicate fibrous tissue. It is, as its name implies, of about the consistence of brain, or of very firm blanc-mange. When cut, it is seen to be of a whitish-yellow colour, or pinkish, if vascular; on pressure there exudes from the cut surface a plentiful *juice*, containing abundance of cancer cells, or nuclei.

In external characters the soft cancer usually forms a tumour of rapid growth, rounded, smooth, more or less lobulated, softer in some parts than in others, not tender. In its earlier stages it may be circumscribed and separable, though it may extend long distances in the interstices of muscles or other organs; in its latter it is usually adherent, blended with surrounding parts, and not moveable. If situated near the surface, it may, by the rapidity of its increase, cause the skin to ulcerate; then, relieved from pressure, it grows with greater rapidity, throwing up huge fungous masses, from whose surface there oozes a thin sanious fluid. This, however, is not peculiar to soft cancers, but common to any other rapidly-increasing growth.

2. The *hard cancer*, or *scirrhus*, or *carcinoma*, has, as its name implies, a much firmer consistence than the preceding variety, which is due to the presence of a dense fibrous tissue; but there may be every gradation, in this respect, from a scirrhus as hard as fibro-cartilage, to the softest and almost diffluent encephaloma. In well-marked examples, a hard cancer cuts crisply; the cut surface shows irregular intersecting, firm, whitish fibrous bands, with a softer grayish or yellow matter in the interstices, from which the cancerous juice can be made to exude by pressure. In outward character it presents itself as a firm, hard, heavy, usually nodulated tumour. This, in cancer of outward parts, after a time, becomes adherent, is subject to severe pain of a stabbing or lancinating character, distends the skin, ulcerates, and forms a more or less excavated ulcer, with hard, fungous, everted edges, constant sanious discharge, and severe burning pain.

3. The *Melanic*, or *Black Cancer*, is cancer usually of the soft variety, infiltrated with pigment. As a primary disease, it generally occurs in the skin, or about the eye. But after a time it may, like the other varieties of cancer, invade every organ in the body. For example, in a case reported by Mr Windsor of Manchester, it was found

in skin, areolar tissue, muscles, pleura, lungs, heart, liver, mesentery, spleen, kidneys, and womb.*

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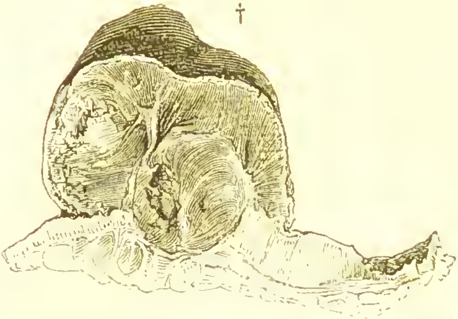

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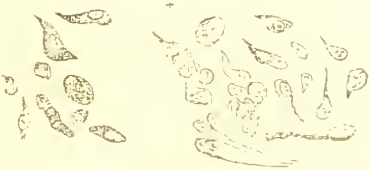

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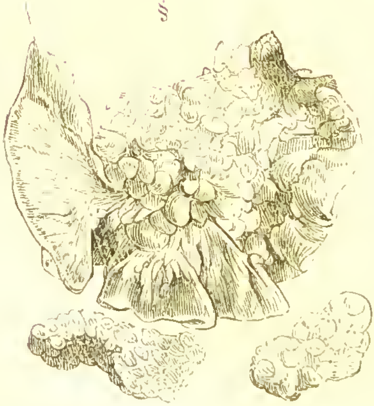

4. *Colloid*, or *Gelatini-form*, or *Alveolar Cancer*, is a peculiar growth, composed of a *stroma* of thin membranous or fibrous material, so arranged as to form circular loculi, resembling in this respect the pulmonary tissue, and filled with globular masses, composed of concentric layers of that structureless material which we have described as colloid matter.

The loculi, or rounded cells, are visible to the naked eye on a section, and may vary from the size of a pin's point to that of an egg. The colloid matter seems to differ much from other animal products, and to resemble the jelly of the umbilical cord, or mucus, or the substance of the intervertebral cartilages, or the tissue of the acalephæ and medusæ. Its animal basis is said to contain only 7 per cent. of nitrogen.

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* Windsor, Prov. Med. Journ. 1850, p. 225 Fawdington on Melanosis, Lond. 1826. It must be admitted that we know not how many of reputed cases of melanosis are cancerous, and how many consist of pigmentary deposit without cancer.

† Nodule of black cancer in the true skin.

‡ Soft cancer impregnated with pigment. From a bay mare.

§ This cut represents the outward appearance of a colloid growth on the mesentery, from King's College Museum. See also Ballard, Med. Chir. Trans. vol. xxxi.; Sibley, *ib*. vol. xxxix., and a classical case in Lebert, Anatomie Physiologique, vol. i.

The rounded masses of gelatinous matter contain granules and nuclei; and the larger masses contain abundance of smaller ones, into which their substance appears to have divided and developed itself after the manner of the growth of cartilage. The gelatinous matter is arranged around these granules and nuclei after the manner of cell-growths.

The question now arises, what is this growth? is it cancer? Most pathologists consider it as cancer, and Lebert describes some, though not all, of the nuclei, as having the characters of cancer-nuclei. The peculiar chemical composition of the mass, however, seems to claim for it a place by itself.

Its most frequent seat by far is the peritonæum and abdominal viscera, yet it is found in the female breast and elsewhere.

It has all the characteristics of cancer except that its progress is slow, and that it is slow in relapsing. It is an infiltrating growth, destroying the tissue it invades, spreading to adjoining parts, affecting the lymphatic glands, and appearing in remote organs; as in a case recorded by Lebert, in which a colloid tumour of the left breast of twelve years' duration destroyed the breast, appeared in the axillary glands, destroyed the intercostal muscles by infiltration; and invaded both lungs, the mediastinum and bronchial glands.

5. *Hæmatoid Cancer* (*Fungus hæmatoides*) is a variety of soft cancer, distinguished by its excessive vascularity, which is sometimes sufficient to cause a sensible throbbing like that of a vascular tumour. Hence arise extravasations of blood into its substance, giving it the appearance of blood-clot mixed with brain. If ulcerated, there are frequent hæmorrhages from the surface. This, however, is common to every form of rapid ulcer, cancerous or not.

6. *Cystic Cancer.*—Cysts may be produced in cancerous growths by the extravasation of blood, and the absorption of the coagulum, leaving in its place a clear or coffee-coloured serum. Or, cancer may be superadded to a previously-existing cystic growth, and may grow from the walls of the cyst as a portion of hypertrophied gland may. Or, lastly (as in the case of cancer of the ovary), it may, from the first, assume the cystic form which characterises the morbid growths of that organ.

7. *Osteoid Cancer* (*Malignant osseous tumour*) is characterised, not merely by the partial ossification of the fibrous or periosteal tissue, intersecting a cancer when developed in or upon bone (which is common), but by the conversion of the newly-developed cancer stroma, first into fibrous tissue of extreme density, then into a peculiar bone. This bone when macerated and dried is exceedingly dense and compact, like ivory; yet dull in colour, rough and porous on its surface, extremely brittle and capable of being reduced to a chalky powder; and may be seen,

under the microscope, to be imperfectly constituted as to its bone structures, and to contain an admixture of amorphous earthy matter. In the recent state its surface is covered and its interstices filled with the dense fibrous matter, and with a few cancer-cells.

8. *Villous Cancer.*—This name has been assigned to a growth composed of the most delicate papillæ, containing each a vascular loop, growing from the surface of mucous membrane, and associated with cancer, or more probably with epithelioma. The bladder is the usual seat of this growth.

CAUSES.—Under this head we have chiefly to confess our ignorance. Neither temperament, mode of life, civilisation, previous disease, nor moral causes have been proved to have any special predisposing influence. Domestic animals and cattle are quite as subject to the disease as man is. The dark and bilious are not more subject to cancer than the light and florid. The rich are rather more liable than the poor; but it is because they are not so often cut off beforehand by other diseases. The healthy, well-fed, the happy and prosperous, are as liable as their less-fortunate brethren. The disease is alleged, however, to be more rare in tropical than in temperate climates; and, although there is no such incompatibility as is sometimes supposed between cancer and phthisis (because cancerous patients often display the signs of pre-existing tubercular disease, and many become affected with phthisis), yet it happens most rarely that any person actually phthisical is attacked by cancer.* External violence cannot be a cause of cancer, although it may perhaps occasion or hasten its development in the injured spot. In fact, the only known predisposing causes are,—1. *Descent* from a cancerous parent, which seems to have some slight influence, and was found by Lebert to exist in about $\frac{1}{7}$ of a certain number of cases. 2. *Sex:* for cancer is at least from $\frac{1}{3}$ to $\frac{1}{2}$ more prevalent in the female. 3. *Age:* because nearly half of the entire number of cases occur between 40 and 60. Lastly—although cancer is not contagious in the ordinary sense of the term, there seems reason for believing that, if fresh cancer-cells are introduced into the blood, they may be deposited and propagate themselves. The experiment has been tried on dogs by Langenbeck and by Lebert; and cancerous tumours were found in various parts, when the animals were killed some time afterwards; yet it must be remembered that some of the tumours found in these cases may have existed before the inoculation.

GENERAL PATHOLOGY.—Our knowledge of the essential nature of cancer is best expressed by the phrase, that it is the consequence of some specific, but quite unknown, condition of the solids and fluids of the body, to which is assigned the name of the *cancerous diathesis.* The type, and the most frequent variety, is the *encephaloma:* for although most of the cancers of the female breast are of the scirrhous variety, and although this is common in the periosteum, dura mater, and pylorus, yet in every other tissue and organ the encephaloid largely prevails. Cancer may occur at any age; Lebert has seen it in the brain of a child of seven months; and believes it may be developed in the fœtus in utero. Cancer of the eye is most frequent under 15; that of the female breast and of the uterus (which form more than a fourth of the entire cases of cancer) between 40 and 60; of the testicle between 20 and 50; of the intestinal tube in advanced life; whilst cancer of the bones is equally frequent at all ages.

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* See case by Mr. Sibley, of concurrent development of cancer and pulmonary tubercle; and two other cases in J. Z. Lawrence on Surgical Cancer, 1855, p. 30.

The PROGRESS of CANCER may be divided into three stages:—

1. In the first, it is *deposited* in the form of liquid blastema; out of which cancer-cells develop themselves. They are contained in the meshes of some natural tissue, or in a new fibrous tissue developed with them. The tissue so formed gradually increases and attracts capillaries to supply it with blood; and may remain for a greater or less time almost without symptoms and unnoticed, if in an organ (such as the skin or breast) whose functions are not active; though in any more important part the functions are sure to suffer. In this stage the constitutional symptoms may be slight, if any.

2. The second is a stage of *active local progress*. The tumour grows faster; begins to adhere to and to infiltrate neighbouring tissues and the nearest lymphatics. And now, not only the functions of the organ affected, and of the others implicated by contiguity, become more decidedly deranged, but other symptoms manifest themselves peculiar to the morbid growth. *Pain* of a most severe, intermitting, neuralgic sort; gradually increasing in severity; felt in the tumour itself as a sharp, stabbing, or burning sensation; in the muscles and bones as a wearing rheumatic pain, often disturbing the sleep at night; sometimes preceding all local disease; sometimes not felt till it is far advanced, is one of the most marked symptoms of cancer. This is quite independent of other pain arising from pressure, distension, or stagnation of blood. So valuable a sign is *pain*, that if after extirpation of a doubtful tumour, the patient complains of neuralgia, secondary cancer may be almost certainly predicted. This practical rule was communicated to the writer by his friend and preceptor Dr. Robert Ferguson. In this stage, also, may occur several changes in the nutrition of the morbid growth. A portion of the cells may undergo disintegration into a granular mass; preceded by fatty infiltration and formation of round granular corpuscles; or by a drying up and condensation; and the portions thus altered form a yellow tubercular-looking mass mingled with the rest of the tumour, which Müller described under the name *reticular cancer*, and Lebert as the *phymatoid*. Ecchymosis, inflammation, and abscess, may occur, or ulceration; but be it observed that ulceration is by no means so common a phenomenon in cancer as is generally taught, unless it be in hard cancer of the skin, breast, or stomach. After ulceration, or before it, portions of the tumour may soften, or may slough away; but none of these changes are curative; for whilst one part is perishing, others are germinating and spreading the faster. Respecting ulcers which form in scirrhous growths, we must observe, that neither the excavated surface, nor the fungous

granulations, nor the raised and everted, or excavated edges, nor the fetid sanious discharge, varied by hæmorrhage, are so characteristic as the hard and fixed base. In some few cases the ulcer may heal; but the cancerous mass beneath remains. The constitutional symptoms of this stage are those of an increasing cachexia, added to the detrimental consequences of pain, discharge and interruption of function. The complexion becomes sallow, the lips pale, the mind despondent (though delirium in any case of cancer is rare), digestion feeble; the flesh and strength waste; and the bones become light and fragile.

In the *third* period, whether because (as the author believes) the blood has become saturated with cancerous plasma, or because a *cancerous infection* has taken place through the molecules or nuclei absorbed from the seat of primary deposit, *diffused* and *secondary* cancerous growths are formed in the liver, uterus, bones, pleura, and other parts; and the increasing functional disturbance, added to the increasing decay of the vital qualities of the blood, ultimately prove fatal.

PROGNOSIS.—The final destiny of a cancerous patient is pretty certain; the time in which the disease may prove fatal is uncertain; it is shorter in the soft than in the hard cancer; in young patients than in the aged; and in cancer of internal organs, especially if of vital importance, than of external. Some patients succumb in a few months; others survive, if carefully treated, several years; but two years, or three, may be considered as more than the usual limits.

TREATMENT.—In the first place, it must be confessed that we know of no radically curative measures, such as are capable of removing the cancerous taint from the blood, and of arresting the growth of the local disease. All that we can do is to check the disease so far as we can, and make the patient's life as long and as comfortable as our means permit.

The first thing to be spoken of is *extirpation; against* which must be alleged the facts—that the removal of one affected part cannot remove the diathesis, and that the disease is almost sure to return in the original situation, or in some other. That in some instances outward cancer is accompanied by the disease inwardly, and that to remove the former would be taking away only part of the disease already existing: for instance, in cancer of the eye, or of the testis, some part within the head or abdomen is commonly affected likewise, and operations in such cases are most rarely successful. That some patients are killed by the operation itself; and that some have died from being operated on for what afterwards proved to be no cancer at all.

On the other hand, *in favour of extirpation* it must be said that life may undoubtedly often be prolonged by it. That if the disease does return, an operation, thanks to chloroform, may be painless, and the interval one of health and comfort; and that it is possible the disease may not be cancer, but some other growth which excision might cure.

The first point the surgeon should consider is, whether an operation can be performed without danger to life; for it would be both useless and unjustifiable to perform it, if the health were so completely broken down, or visceral disease so advanced, that the patient was liable to sink after it, or if the diseased mass were so adherent, or extensive, that it could not be removed effectually, so that the wound made by the operation would not heal.

The methods of extirpation are two—the knife, and caustics. The knife is undoubtedly to be preferred in all cases as the more merciful; and decidedly so, if the tumour is circumscribed, and can be removed entire, leaving a wound capable of healing by the first intention, so as to give the patient the chance of the most rapid recovery possible.

Caustics, or astringent substances used assiduously, and in sufficient strength to shrivel up and kill the diseased tissue, are of the greatest service in cases for which the knife is not available. In the case, for instance, of an open fetid sore, or of a protruding mass giving issue to blood or to fetid sanious discharge, the chloride of zinc, in the form of *Burnett's solution*, is an admirable thing. The writer has long been in the habit of using it in cancer of the womb; and its powers of checking fetid discharge and bleeding, of allaying burning pain, and of causing soft masses to shrink, are great. It may be applied in varying strength according to circumstances; so dilute as to be a mild astringent and deodorizer, or so concentrated as to be a powerful caustic. The point seems to be to deaden the surface, then to get it to absorb as much of the chloride as possible, so as to *tan* a considerable depth, and to continue the process till the whole of a diseased mass comes out as a slough.

One part of the solution to 64 of water is a good proportion to begin with, but it may be increased. F. 117.

There are other caustics in great variety from which the surgeon may make his choice,* such as Manec's arsenical paste, or Canquoin's chloride of zinc paste, described at p. 77. Dr. Simpson recommends the sulphate of zinc dried and powdered, and sprinkled on the sore, or made into a paste with glycerine or lard, in the proportion of an ounce of the sulphate to a drachm of glycerine, or two drachms of lard. It is not deliquescent, and like the chloride does not attack sound surfaces. The concentrated sulphuric or nitric acid, made into a paste with tow, saffron, sawdust, or asbestos, is an efficient though less manageable caustic; the concentrated solution of chloride of iron, the acid nitrate of mercury, the permanganate of potass, and various other caustics may be mentioned, but the sulphate or chloride of zinc appears the best.

If it be desired to penetrate deeply into a large mass of cancerous tissue it may be done in three ways,—by deadening the surface with chloride of zinc, and then cutting through the slough nearly down to the living part, and inserting more of the caustic into the incisions—or by puncturing and injecting a few drops of solution of chloride of iron, as is done for nævus—or by inserting into the diseased mass small lozenges or *stylets* composed of chloride of zinc, flour and water, baked till they are hard enough.†

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* An interesting account of them all is given by Mr. Spencer Wells, Med. Times, July 11, 1857. See also Simpson, Med. Times, Jan. 17, 1857.

† Med. Times, Feb. 7, 1857, p. 141.

In the case of cancerous masses which are so adherent and extensive that they cannot be removed by the knife, and in which the skin is not yet ulcerated, we believe that puncture and the injection, or insertion just described, so as, if possible, to eradicate the tumour with as little destruction of skin as possible, is the best plan, if any plan of extirpation be determined on.

Since the preceding edition of this work was published, an American plan of treating cancer has risen, flourished, and decayed in London, by which the public were promised, not merely that local deposits should be removed, but that the disease should be eradicated from the blood. The means employed were, destruction of the skin by nitric acid, and of the cancer by chloride of zinc, introduced into incisions made in the first slough. The chloride was mixed with a red root—the sanguinaria—which has some stimulating properties, but, so far as cancer is concerned, is inert. What the nature and results of this treatment were, so far as the writer has had the opportunity of learning, may be gathered from the following memorandum of one case:—

On May 15th, 1857, he saw a lady, æt. 46, wife of a clergyman; childless; fifteen years ago she struck the left breast; a *lump* ensued, slowly increased, and became of late very painful; a gland in the axilla was also enlarged and painful; she suffered severe pain in the tumours, and above the clavicle in the neck; she had been seen by several surgeons during the last five years, all of whom said that the case was not fit for an operation. In March, 1857, she put herself under the care of a gentleman who professed to cure cancer. On the 25th, a large portion of the skin of the bosom (including the nipple), and over the gland were destroyed by nitric acid; after this, the slough was gently cut through, and various substances inserted into the cuts; the pain was most agonising, and brought on violent flooding; she sat in bed hour after hour, rocking herself in agony; the discharge was very profuse; but an essential part of the treatment was that she was not allowed to keep her bed, but was taken daily into the open air in an easy chair: she lived well, and drank plenty of wine. In December the writer saw her again; she said that the first slough had been six weeks in separating, and that it was obliged to be removed by scissors; that the wound was six months in healing, if healed it could be said to be; for it had left a large tense red thin cicatrix adherent to the ribs, which cracked and bled every time she coughed. Her breathing was difficult, her cough severe, there were swellings above the clavicle, and evidently cancerous deposit in the chest. She was greatly emaciated; strength and appetite gone; pain constant. At the first interview she was hopeful, and said she had been relieved of the neuralgic pains above the clavicle; at this second interview she condemned the whole treatment as a delusion. She assured the writer that three ladies who had begun the treatment in March, when she did, were already dead; and she followed them in February, 1858. So this poor creature had passed the last year of her life in unutterable torture.

So much for extirpation. But the very hopelessness of the disease ought to stimulate the surgeon to use every effort to delay its course and soothe the patient's sufferings. The *growth of the tumour may in some cases be checked* by the incessant application of cold, by means of bladders filled with ice, or with a freezing mixture, on Dr. James Arnott's plan—or by pressure, with Dr. N. Arnott's slack air cushion. *Powerful astringents*, as the tannic and gallic acids, may delay the growth of, and check oozing from a rapidly-growing soft cancer. F. 186.

2. *Antiphlogistic* measures are quite powerless against cancer; but when it is mixed with some degree of common inflammatory effusion, which is apt to give a great impetus to the cancerous growth, a few leeches, cold applications, and alterative does of Plummer's pill may be of great service.

3. *Tonics*, and especially the iodide and other preparations of iron, and quinine, are desirable in order to assist in forming healthy blood, and enabling the system to withstand the ravages of the disease.

4. *Specific* remedies—such as iodine and its preparations, bromine, arsenic, and ergot of rye—are not known to be of service.

5. *Narcotics* may be given most unreservedly, for the purpose of subduing the gnawing pain and irritation which tend rapidly to exhaust the nervous system. Opium in the solid form, given regularly and boldly, is the sheet-anchor. Conium and other remedies of its class may be tried.

6. As *local applications*, during the earlier stages, fine cotton wool dusted with iodide of lead, and an occasional painting with tincture of aconite, or application of a bladder of ice, or of a lukewarm lead and opium lotion, to relieve the neuralgic pain.

For the ulcerated stage the local remedies may be arranged under the following heads:—1. The soothing, including the opiate and conium lotions, F. 120, on lint covered with oiled silk; poultices, F. 157, medicated with the same remedies; chalk, lead, and bismuth ointments. 2. The gently stimulating; as the black-wash, carrot poultice, yeast poultice, weak zinc or nitrate of silver lotions. 3. The astringent; as the lotions of iron and tannin, F. 128, 131; or poultice of bread and powdered matico. 4. The antiseptic; as lotions of the chloride of lime or of zinc, or of creosote; of acetate or nitrate of lead, or Condy's disinfecting fluid. We may add that poultices should not be applied too warm; and that care should be taken not to let the skin around become pimpled or excoriated. If it should, the tannin lotion, or bismuth ointment, are the best applications. A flat bag of peat charcoal, dry, and wrapped in flannel, may be laid over the wound, to absorb effluvia.

7. The general health and strength must be carefully looked to, since whatever disorders these will hasten the progress of the disease. Good diet, cod-liver oil, change of air, tranquillity of mind, and means for securing a proper action of the eliminative organs, will greatly aid in prolonging life, and in lessening the sufferings which our art cannot prevent.

SECTION X.—ELEPHANTIASIS ARABUM.

Under the term Elephantiasis, two dissimilar diseases have been confounded. One, the Elephantiasis, so vividly described by Aretæus, the *Elephantiasis Græcorum*, which begins by tubercular swellings of the face; the other, the *Elephantiasis Arabum*, which we propose to describe here. It consists in a slow hypertrophy of the skin, areolar tissue, and bones, and in their infiltration with a peculiar cacoplastic deposit. The epidermis is thickened and the papillæ enlarged, *but not much:* the true skin is immensely thickened: its fibrous structure dense and almost rigid: the areolar tissue thickened, its areolæ expanded, and filled with oily or gelatinous-looking stuff. In cases which the writer has examined, the microscopical appearances were those of hypertrophy of the tissues involved. The bones also of the affected limb became enlarged and heavy.

This is peculiarly a disease of warm climates. The dark races are more liable to it than the fair. In India, it is particularly liable to attack the scrotum, which it converts into a huge tumour. (See *Scrotal Tumour*.) In the West Indies the leg is its favourite seat, hence the term *Barbadoes leg.*

The best description of it is that given by Mr. Dalton, an able practitioner of Guiana;* and from this it plainly appears, that it is from the first a constitutional malady. It begins insidiously with feverish or aguish symptoms, pain in the leg about to be attacked, firm doughy swelling resembling that of *phlegmasia alba dolens*, and some tenderness of the lymphatic glands. In the course of months, or perhaps of years, the patient suffers a frequent repetition of these attacks; the limb becomes permanently swelled, and in confirmed cases presents a huge, misshapen, useless mass, like the leg of an elephant; hard, and almost insensible to the touch, yet painful. A fœtid serous discharge is liable to ooze from the skin; or ulcers may form, and if not very extensive, may diminish the pain, and seem to eliminate a something noxious.

TREATMENT.—The usual thing proposed is the knife; but Mr. Dalton has shown that in the earlier stages the disease may be at least controlled, if not checked. The remedies he proposes, are, first, a course of thorough eliminatives, purgatives, and emetics; followed by tonics. Afterwards, the limb should be thoroughly and tightly bandaged. Fomentations with astringent decoctions and lotions; the preparations of iodine, diuretics, and a small issue on the outside of the thigh are the remedies for the later stages.

SECTION XI.—GENERAL DIAGNOSIS OF TUMOURS FROM CANCER.

The DIAGNOSIS of cancer implies—1, its distinction from other tumours in the living body, which is chiefly based upon its uncircumscribed and adherent nature, and the severe and increasing pain and cachexia, which are sure to be present, if it has existed any time, or if it exists in many separate organs; 2, its distinction anatomically after removal; and here it must be remembered that the one absolute, physical sign, is the cancer-cell, or nucleus, detected by the microscope.

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* Lancet, 1846, vol. ii. p. 453.

The student, who wishes to ascertain the microscopic nature of a tumour, should first carefully note its consistence, colour, and general appearance. Then he should divide it by a clean incision, and note carefully whether any liquid exudes from the cut surface, with or without the aid of slight pressure. If the liquid is mere serum, tinged with blood, the tumour probably belongs to the fibrous or fibro-plastic species, in which the cell-structures are sufficiently developed to be coherent (see p. 98). If, on the contrary, a milky or gruelly juice exudes, easily mixable with water, this must be carefully searched to determine the nature of the solid substances which give the milky appearances. They may be pus, or granular corpuscles, or epithelium; but if, on repeated examination, they present the characters of cancer-cells, or nuclei, the diagnosis is complete. If no juice is yielded, the tumour may be examined in sections.

1. *Inflammatory induration* is infiltrating and adherent, but never causes so hard, lumpy, and distinct a tumour as cancer. It contains fibro-plastic, or pus-cells.

2. Soft cancer may present such apparent fluctuation as to be mistaken for *abscess;* but its greater elasticity and inequality of surface may serve as distinctions.

3. *Ulcerated cancer* is distinguished from any simple ulcer, and from lupus, by the pre-existence of cancerous tumour, and by its hard and immoveable, and extending base. From the ulcer of *epithelioma,* it is differenced by the warty origin, and the hypertrophy of the cutaneous papillæ of the latter. But as the two affections may coexist, and as extirpation is the remedy for each, it is important to attend to the microscopic differences of structure, in order that it may be known whether it is the almost surely fatal cancer, or the possibly curable epithelioma, that the surgeon has to deal with. If cancer, there will be found the cancer-cells, or if not, an abundance of cancer nuclei, with one to three nucleoli; and in most cases of cutaneous cancer, melanotic infiltration. On the contrary, in epithelioma there will be found the epithelial cell, in every variety, with their large, flattened, and often folded walls, with *nuclei, smaller proportionably than those of cancer* (for the nuclei of epithelial cells are mostly of the same size, nearly in every cell; they do not grow with the cell, as cancer nuclei do), and there are the concentric pellets or asparagus-like rolls of epithelium. But as Lebert well observes, it is very possible that *some* epithelial cells may be found so like *some* cancer-cells that it is hardly possible to distinguish between them. In any case, however, it is the character of the great mass, and not of individual, possibly exceptional, specimens that should be regarded. Moreover, epithelial tumours yield no *juice;* or if a liquid be squeezed out, or scraped up, it does not mix uniformly with water, as pus and cancer juice do, but runs into clotty or leafy

masses, composed of large numbers of adherent cells, with clear water in the interstices of the masses.

It is sometimes stated that cancer may be diagnosed by the *microscopical appearances of the discharge.* But this is fallacious. The cancer-cell would perish on an ulcerating surface, and could scarcely be distinguished amidst the pus and ichor present. Ulcerated epithelioma may be more easily distinguished, because epithelium is less destructible and more likely to come off in coherent masses. The cut at p. 106 represents a papilla from epithelioma of the bladder, found in the urine, and diagnosed during the patient's life.

4. Soft cancer of the *fungus hæmatodes* variety, when abundantly vascular and pulsating, may be mistaken for an *erectile tumour*, or *aneurism by anastomosis.* But the long, perhaps, congenital duration of the erectile tumour, with the fact that the pulsating cancer must be of very rapid growth, and that the erectile tumour can generally be emptied by steady and continued pressure, are leading diagnostic marks.

5. *Glandular hypertrophy* (*chronic mammary tumour of the breast*) may be distinguished by its finely-grained surface, like that of the fully-developed gland during lactation; by its mobility; and by the absence of adherence to the skin, of retraction of the nipple, of swelling of the lymphatics, and of serious derangement of the health.

6. Enlargement of the *lymphatic glands* may be distinguished from cancer by the circumstance, that if one only is affected, it presents a smooth, uniform, or lobulated surface; that it is not adherent; and that it is neither so hard as the hard, nor so soft as the soft cancer. If several glands are enlarged, they are not adherent to each other; they do not increase at the same rate as cancer does, nor affect the general health.

7. *Tuberculosis* differs from cancer in affecting by preference the lungs and lymphatic ganglia in young subjects; whereas the eye and bones in the young, and the breast, womb, and stomach, in the old, are the favourite seats of cancer. Tubercular deposit may continue for any indefinite time, and may be perfectly eliminated by suppuration, or may undergo earthy transformation; and the general health may improve in time: not so with cancer. Tubercular deposit has no vascularity of its own; and its small cells, destitute of nuclei and nucleoli, mixed with solid amorphous matter, not floating free in a special juice like those of cancer, and not readily and equally diffusible through water, ought not to be confounded with cancer-cells.

8. *Fibrous Tumours* present a rounded, smooth, firm, elastic surface; non-adherent, and not softer at some parts than at others; the neighbouring lymphatic glands are unaffected, and they may acquire large dimensions without serious cachexia. After extirpation, the naked eye will recognise the white fibrous tissue, with few vessels, and no infiltrating juice containing cancer-cells.

9. *Enchondroma* differs from cancer in the circumscribed nature of the tumours, which leave the articulations and other neighbouring parts intact; in their smooth rounded surface; and in their not producing

cachexia, even though multiple and of long duration. Microscopic analysis shows cartilage-cells embedded in a hyaline substance. But supposing that some of these cells are set free by the softening down of the intercellular substance, in which case they may have some resemblance to cancer-cells, or even that a portion of enchondroma is contained in a cancerous growth, a little attention will prevent error.

10. Lastly, the *Fibro-plastic Tumour* seems more nearly allied to cancer in development and clinical history than any other except epithelioma, and often closely resembles it in rapidity of growth. Yet it usually differs from it in having its surface regularly and uniformly lobulated, and of uniform consistence; it is usually circumscribed and non-adherent, unless it has been subject to inflammation; it does not usually infiltrate other textures, nor affect the general health. In its microscopic elements, whether, as Lebert observes, it be of the soft gelatinous or of the red fleshy variety, there is an entire absence of cancer-cells, and the constant existence of fibro-plastic cells, depicted at p. 23, and every series of forms between mere nuclei and fibres elongated and fusiform. Yet it must be remembered that these tumours are exceedingly apt to return after extirpation; that possibly they may become multiple; or even after extirpation be replaced by cancer.

The *Myeloid Tumour*, which probably ought to be treated of as a special affection of bone, may be distinguished by the large mother-cells, depicted at p. 99.

PART III.

DIFFERENT KINDS OF INJURIES.

CHAPTER I.

BRUISES AND SUBCUTANEOUS INJURIES.

SECTION I.—INTRODUCTION.

DEFINITION.—Injuries, consisting in the division of various tissues, without wound of the skin; or if with a wound of the skin, one which is very slight and quickly healed.

This definition includes *bruises* or *contusions*, that is, injuries inflicted by blows with blunt weapons, as well as *strains* or *sprains*, which consist in the rupture of tendinous or ligamentous fibres, by over-stretching; besides *simple fractures* and dislocations, and those subcutaneous wounds which are made by surgeons in tenotomy and other operations.

Pathology.—There is a great distinction between injuries without and with wound of skin; for, as Hunter said, wounds "in which the parts do not communicate externally seldom inflame, while those of the second order commonly both inflame and suppurate."

The general progress of subcutaneous injuries is this. At first there is a certain amount of pain from the injury, consisting in a perpetuation of the original sensation of injury. There is some amount of extravasation from the blood-vessels which are torn: and there will be probably in twenty-four hours some amount of throbbing or *inflammatory* pain, with an increase of swelling, from inflammatory exudation. But if the case does well, all inflammation soon ceases; inflammatory exudation and effused blood are absorbed; and there is an exudation of pure plastic material, which fills the gap of the severed muscle, tendon, or bone, as the case may be, and which infiltrates slightly the adjoining portions of tissue. This soon begins to organise itself, after the manner of nucleated blastema, described in the Chapter on Repair, and becomes a fibrous tissue, by which any severed parts are united.

If the blood be in a diseased state, and charged with material for inflammatory exudation, or if the reparative material be injured or disturbed, a subcutaneous injury may lead to abscess.

The reason why a subcutaneous injury should be so much less dangerous than one in which the skin is divided—why, for example, a simple fracture or dislocation should be comparatively safe, whilst a compound fracture or dislocation is a highly dangerous accident, appears to be this; that the wound in the skin may be easily hindered from uniting by a variety of disturbing causes; and that the exudation, in contact with the air and external bodies, is liable to undergo decomposition; and that the state of decomposition may spread throughout the wound, and give rise to various local and constitutional disturbances, varying from slight inflammation, or suppuration, to pyæmia.

Treatment.—The general indications are, to put the injured part into an easy posture and keep it at perfect rest; to apply moderate pressure, so as to check exudation; to soothe pain, purify the blood, and so prevent inflammation and endure speedy repair.

SECTION II.—BRUISES AND ECCHYMOSIS.

DEFINITION.—A bruise or contusion signifies an injury inflicted by some blunt object, without perforation of the skin.

Bruises may be divided into three degrees. 1. Those which produce some laceration of small vessels in the areolar tissue, and perhaps some division of muscular fibre, accompanied with ordinary ecchymosis.

2. A *large vessel* may be ruptured, so that blood is effused in considerable quantity, and tears up the cellular tissue, in which it coagulates; or if an artery is ruptured, a false or diffused aneurism may be the result.

3. The tissues may be irretrievably pulpified and *disorganised;* as happens from the contact of a spent cannon-ball, for instance.

ECCHYMOSIS.—When ecchymosis has been produced in the skin or immediately beneath it, there appears a swelling of a reddish colour, which speedily becomes black. On the third day it is violet, and the margin, which was at first well defined, is found to be faint and diffused. About the fifth or sixth day the colour becomes green; on the seventh or eighth, yellow; and it gradually disappears about the tenth or twelfth—sooner or later, according to the vigour of the individual, and the quantity of blood effused.

If an ecchymosis be formed in the cellular tissue without injury of the skin, no discolouration may appear for twenty-four hours; and if it be more deeply seated among the muscles it will not affect the skin for some days, and may then appear at a part quite remote from the seat of injury; and, in this last case, will usually be in the form of irregular yellow spots, marbled with green and blue.*

CAUSES.—Ecchymosis may be produced by many other causes besides contusions. It is a symptom of certain diseases, as scurvy, purpura, and the last stage of fevers. It may be a consequence of oblique wounds, which do not permit the blood to flow freely out; of spasms, and other violent contractions of the muscles; it may also be caused by suction (as after leech-bites), especially in a part where the skin is thin. It may further be simulated by the application of colouring matters to the skin. Lastly, ecchymosis produced during life may require to be distinguished from various appearances arising after death.

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* Devergie, Médecine Légale, Paris, 1836, tome ii. p. 57.

Diagnosis.—*Ecchymosis produced by suction* may be distinguished from that which is the result of injury, by being generally in the form of small round spots, and situated on the inside of the arms or female breasts; and the surgeon required to decide on the cause of such marks should consider whether they correspond in their appearance to the date which is assigned to them.

Artificial discolouration of the skin may be distinguished from ecchymosis by its being generally in round or irregular spots, fringed at the edges.*

Ecchymosis produced during life may be distinguished from the livid discolouration of *incipient putrefaction*, or that which is caused by the gravitation of blood in a dead body, by noticing that, in the first case, blood is effused into the cellular tissue, and is incorporated with the cutis, which is thickened; whereas in the two latter cases, the blackness will be confined to the surface of the cutis, and if blood is effused into the cellular tissue, it will be only at some depending part, and will be fluid, and not coagulated.†

Treatment.—The indications are (1) to check extravasation of blood: (2) to prevent inflammation; (3) and afterwards to produce absorption of the effused fluids and restore the use of the parts.

The bruised part should, if possible, be placed in a raised position; and cold or iced water, or a bladder containing ice, F. 114, should be applied at once; and a sufficient number of leeches, if there are signs of *inflammatory* pain and swelling, but not otherwise. These measures, together with rest, moderate purgatives, and not too full a diet, will suffice for the first two indications; whilst the third will be fulfilled by friction with stimulating liniments, and a bandage after tenderness has subsided.

If the effusion of blood is great—if the skin is so tense that it will inevitably either burst or slough—an incision *may* be made into the swelling, but it is better avoided. Then the clot will be gradually extruded by the contraction of the cavity, and a simple granulating wound will be left. But it is very bad practice to squeeze out the coagulum, as the bleeding might be brought on afresh, and severe inflammation be excited.‡

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* Fallot, de la Simulation et de la Dissimulation des Maladies, Bruxelles, 1836, p. 67.

† Beck's Medical Jurisprudence.

‡ Hunter on the Blood, part ii. chap. ii. sect. i.

If an artery of considerable size is lacerated, which will be known by the situation of the contusion, and the great and rapid swelling, the case must be treated as a *diffused aneurism.*

Fingers or toes, however severely bruised, should not be hastily amputated.

CHAPTER II.

WOUNDS.

DEFINITION.—Wounds are commonly defined to be *solutions of continuity*, or separations by external violence of parts which ought to be united.

VARIETIES.—The *incised* wounds, or those made with clean-cutting instruments; the *punctured*, or those made by instruments whose length greatly exceeds their breadth, including stabs, and pricks of all sorts; the *lacerated*, in which parts are torn; and the *contused*, or those effected by bruising, are the chief varieties.

The *incised* are produced with the least violence, and generally admit most easily of repair. The *punctured* are dangerous from their depth, and from the possibility that deep blood-vessels or viscera may be injured, or that deep-seated extravasation of blood, or abscess, may follow. The *lacerated and contused* wounds are produced with greater violence, less likely to heal, and more prone to slough or suppurate. They do not however, in general, bleed so much as incised wounds, because arteries, when torn, contract more than when cut.

TREATMENT.—The treatment of all wounds comprises four indications:—1, to check bleeding; 2, to remove foreign bodies; 3, to bring the divided parts into their natural position and keep them in union; 4, to promote adhesion.

(1) To *check bleeding*, moderate pressure, a raised position, and the application of cold, will be sufficient in most cases; but if an artery have been wounded, or the bleeding prove obstinate, the measures must be adopted which will be pointed out in the Chapters on Wounds of Arteries and of Veins.

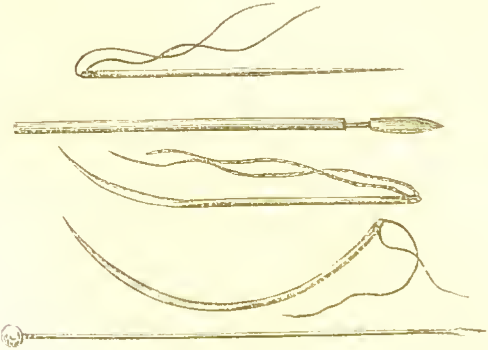
(2) The *removal of foreign bodies*, if any are in the wound, should be effected as soon as possible, by the fingers or by forceps, or sponge and water. Dirt, gravel, &c., are best got rid of by affusion with water. All clots of blood must likewise be removed.

(3) In order to *bring the sides of the wound into contact*, the part must be placed in such a position as will relax any muscular fibres that have been divided, or that lie under the divided parts. Then the edges must be made to meet as nicely as possible. On this point the surgeon should use the utmost diligence, because the more that the parts are adapted, the less chance will there be of suppuration, and the more speedy and free from deformity will the cure be. The edges of the wound may then be kept in their place by cross strips of adhesive

plaster, one end of the plaster being first applied to that side of the wound which is loosest, and the other being brought across. Then a compress and bandage may be applied to keep on the dressings, and protect the parts from injury, and should be applied with such a degree of firmness as feels comfortable, and will have the effect of preventing bleeding or other exudation. This point requires particular attention in subcutaneous surgery. If the wound is so situated that the plaster cannot be applied smoothly, a compress of lint may be laid on it first.

Collodion.—A very useful substitute for adhesive plaster in many cases is the solution of gun cotton in ether, commonly known by the name *collodion.* This when applied to any surface dries instantly, forming a semi-transparent film of considerable tenacity, adhering firmly, and forming an artificial scab under which wounds often heal without any suppuration. In applying it, the edges of the wound should be held together as exactly as possible by an assistant, whilst a thick layer of the collodion is smeared across with a brush or small spatula. It is useful to apply it in the intervals of stitches or plasters, in order to exclude the air. This substance contracts so strongly that it should be put on in *one layer,* once for all; not in repeated layers, else those which are put on afterwards will drag off those applied first. Thick mucilage sometimes is used for the same purpose; so is Friar's balsam.

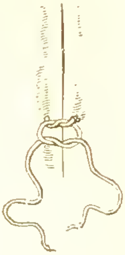
Sutures.—In all extensive wounds, and most especially in wounds of the eyebrows, eyelids, ears, and other parts which it is most important to make to unite neatly, and in which plasters would be insufficient, *sutures,* or, in plain English, stitches, should be employed. Yet the surgeon must never employ them in order forcibly to drag the lips of a gaping wound into contact, or they will give great pain, and his intentions will be frustrated by their speedily ulcerating. They may be removed in from three to six days; sooner if violent irritation comes on.



The requisite needles are shown in the foregoing cut: the straight *glovers' needle* at the top is very convenient, and may be procured at any cutler's.

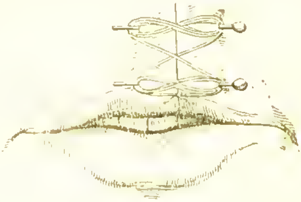
Five species of suture are enumerated in the older authors.

1. The *Interrupted Suture* is thus made. A needle armed with a single ligature is passed through the skin on one side of the wound *from without*, inwards; then at a corresponding part through the other lip *from within*, outwards. Then the ends of the ligature (which may be made of silk, or hempen thread, well waxed) are to be drawn together, without, however, any great straining, and are to be tied tightly in a double-reef knot. Silver or leaden wire is sometimes used for sutures, and has this advantage, that it does not absorb fluids, and so cannot be converted into a seton.



As many of these stitches are to be made as are necessary; half or three-quarters of an inch is a proper interval.

2. The *Twisted Suture* is made thus:—The edges of the wound having been placed accurately in contact, a sufficient number of pins are to be passed through both of them at convenient distances. The first pin should be placed at any loose angle which there may happen to be. When all the pins have been introduced, and the parts are accurately adjusted, the middle of a long piece of silk is to be twisted around the uppermost in the form of a figure of 8. Then the two ends are to be brought down and twisted round each other pins successively in like manner; and, lastly, are to be secured by a knot.



The pins were formerly made of silver, with steel points which were removed after they were inserted; but fine steel needles with lancet points are now used instead. After they are inserted their points must be cut off with pliers.*

3. The *Glovers'*, or *Continuous Suture*, is nothing more than the ordinary way of sewing things together practised by seamstresses and housewives. It is employed in wounds of the intestines and abdomen.

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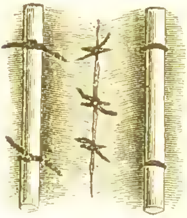
* The old harelip pin is the second of the needles at p. 128, and the new needle the last.



4. The *Quill Suture* is performed by passing a sufficient number of ligatures with the needle here represented; but instead of being tied to their opposite neighbours, all the threads on each side of the wound are fastened to a bougie, or metallic rod, perforated with holes. It is very advantageous in pressing the deep parts of a wound together, and is used in lacerations of the female perinæum.

5. The *Dry Suture* was made by sticking a strip of adhesive plaster, or (before that was invented) a strip of linen smeared with white of egg and flour, to the skin on each side of the wound. The adjacent margins of the plaster or linen were then sewed together.

(4) The fourth indication is to promote the process of adhesion. For this purpose every circumstance that will disturb the lymph exuded, or that will cause it to decompose, must be scrupulously avoided. The wounded part should be kept absolutely at rest, and if the wound be at all severe the patient should be sent to bed. Pain and mental disturbance should be allayed, and sleep procured by opium; the importance of which in preventing fever and pyæmia cannot be over-estimated. The bowels should be relieved, in order to combat any tendency to inflammatory exudation, and the diet be regulated. In most cases just as much light food as will replace the waste of a man at rest is sufficient: in some it may be necessary to give meat and wine, in order to make up for loss of blood, and supply material for healthy exudation. No bandages should be tight enough to cause irritation or constriction. If much pain and swelling supervene, all tight applications and sutures must be removed, and fomentations or poultices be applied, till the inflammation has subsided, or till suppuration is established. Then the parts may be again gently approximated, that they may heal by the *second intention;* that is, by the inosculation of their granulations. In wounds, as in other inflammatory cases, cloths dipped into cold water, or a bladder filled with ice, is sometimes more comfortable than warm applications.

CASES OF COMPLETE DISUNION.—If any small portion of the body (a finger or part of the nose, for instance) has been completely cut off, and if it be reapplied as soon as possible, and retained by plasters or sutures, and wrapped up so as to preserve its temperature, it will very probably unite again. And even if such a part have been separated for a considerable time, the attempt should not be given up; but it should be well washed with warm water to free it from dirt, and the stump should also be bathed, so as to remove any dry coagulated blood, before they are reapplied to each other. One case is related in which the last phalanx of the middle finger was cut off, and after an hour and a half was replaced, and united firmly.*

CURE OF OPEN WOUNDS.—If a part has been abstracted which cannot be restored, or if any kind of wound cannot be covered by skin, as is the case with lacerated and irregular wounds, the first plan on which it may be treated, is by endeavouring to form a *scab*, by covering the wound with pledgets of soft lint soaked in blood, which are to be allowed to dry and adhere. This is the natural and simple way in which most slight accidents heal when not interfered with by art; and Mr. Wardrop has seen the large surface exposed by the removal of a diseased breast heal completely under a crust of blood in thirty days. The old-fashioned remedy, the *Friar's Balsam*, or *Tinct. Benzoes comp.*, is an excellent application for wounds attended with some degree of contusion. It causes the blood to coagulate, and seals up the wound from the contact of the air, and from infectious miasmata.

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* Baily, H. W., of Thetford, Ed. Med. and Surg. Journ., July, 1815.

If there is no pain or bad smell, the wound should be allowed to remain unopened till the scabs drop off, and show a cicatrix underneath. But if it becomes painful, and a fetid matter oozes out, warm poultices or water-dressing should be applied, and the wound be treated like a common granulating sore.

Or, instead of attempting to form a scab, the surgeon may apply water-dressing or poultices from the first, when, if the case proceeds favourably, the wound will become filled with a pink lymph, which forms a pliant cicatrix, without granulation, and without suppuration.

Abscess after wounds.—After punctured wounds, or after any extensive surgical operation, or other wound, it is possible that part of the exudation, or that some portion of coagulum may decompose and cause suppuration, even after the wound in the skin has healed; and that the sanious fluid which results may find its way into the veins and cause serious consequences. Pain and tenderness, restlessness and shivering, will cause the surgeon to examine the track of the wound carefully, and to make an incision if there is any mischief underneath.

PUNCTURED WOUNDS.—The first point usually mooted in discussing the treatment of these wounds is the propriety of dilating them, and converting them into simple incisions, in order to avert deep-seated suppuration and confinement of matter. But as those evils by no means follow of necessity, an endeavour should be made first to prevent them. To this end, the part should be kept at perfect rest, and should be bandaged with an agreeable degree of firmness, so as to prevent subcutaneous oozing of blood, which is the most likely cause of inflammation. If necessary, low diet, purgatives, cold lotions, and leeches, must be employed. But if, notwithstanding, there should be severe pain, and swelling, and fever, a free incision must be made for the relief of tension and the discharge of matter; and the case must be treated in the same manner as a deep-seated abscess.

CHAPTER III.

GUN-SHOT WOUNDS.

SECTION I.—GENERAL DESCRIPTION.

DEFINITION.—Under the term *gun-shot wounds* are included all the injuries caused by shot and other substances discharged from fire-arms, by fragments of stone or splinters of wood struck thereby, and by the bursting of fire-arms, and of shells.

"The CANNON-SHOT," says Mr. Cole, "for the first five or six hundred yards grinds to powder and destroys everything that opposes its hissing course."* If it strikes a limb it either carries it away or completely smashes it, pulpifying all the tissues with which it comes into contact. The shock in such cases is always very severe, and often fatal of itself. The hæmorrhage is usually slight: a gush of blood escapes at the moment the injury is inflicted, but the torn vessels soon retract, and bleeding for a time is stopped. There were, however, a few instances, during the Crimean campaign, in which fatal hæmorrhage from the femoral artery was caused by cannon-shot injuries.

When the shot has travelled some distance, so as to have lost a portion of its impetus, the injury which it inflicts is often even greater. Instead of going right through the part struck, it will allow itself to be guided, or its course to be changed, by objects which it may meet in its way, and will thus give rise to wider and more serious injuries.

This happened in the case of a private in the First Royals who was working in the trenches before Sevastopol. He was in the act of shovelling up some earth, with his body bent, and his right hand, in which he held the handle of the shovel, low down in front of the space between his legs. In this position he was struck by a round shot. It shattered his arm, leaving it hanging only by the integuments, and, passing between the thighs at their upper part, it tore away from each of them a large mass of the integuments and muscles, and laid bare the femoral artery on one side. It carried in front of it the penis, and scrotum, and anus, and, guided by the curve of the buttocks, it swept away a large portion of the glutæi of one side.

Cannon-shot when nearly spent may produce severe injury without breaking the skin. Bones may be broken, or the deep tissues so contused as to lead to severe sloughing and loss of the parts.

However near the end of its career a round shot may be, it still carries destruction with it; and many a soldier's foot has been knocked off, when put out to stop a shot, slowly ricochetting along like a cricket-ball.

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* Cole, J. J., Military Surgery, or Experience of Field Practice in India during the years 1848 and 1849. Lond. 1852.

It is rare for round shot to lodge themselves, yet a case occurred in the Balaklava action in which a six-pound shot was found lodged in a man's ham, with comparatively little distortion of the limb.

Much has been said of the effects of the *windage* of balls, that is, of injuries supposed to be produced by balls going near without touching, and ascribed to a current of air accompanying the ball. But later experience has shown the fallacy of all the views once entertained on this subject. Men's clothes have been torn, and even their caps carried off their heads by round shot, without producing any injury worth mentioning.*

SHELLS.—If a shell strikes anything before its explosion, it produces effects similar to those of round shot. After it has burst, the wounds inflicted by its fragments are not so severe as those of cannon-shot, although they certainly rank next in the amount of damage they produce. The large, irregular masses of iron often cause the most fearful contusions and lacerations of the tissues, and comminution of the bones. The extent of mischief produced by them may be estimated by the fact that during the late war the bursting of one howitzer shell caused ten admissions into the hospital of the 18th regiment, and that of the men so admitted seven lost an arm or leg.

MUSKET SHOT.—The largest number of wounds in any engagement is from musket balls. Until the late war, the old round leaden ball, fired from a plain or rifled barrel, was the only one in common use. Now, however, its place has been supplied by the conical ball, in our own and most of the continental armies, including that of our late enemies the Russians. As our men were wounded by both kind of balls, there were ample means of testing their destructive capacities. The conical balls being projected with much greater rapidity, are capable of passing through one or two men, and lodging themselves in the body of a third. They did not appear to deviate from their course to the extent that the old balls sometimes did. What they struck they usually perforated, in some cases drilling through bones, in others producing severe comminuted fractures. They lodge much less frequently than the round ones, and are far more destructive as instruments of warfare. Again, the ball may, if the force is nearly expended, lodge in the cancellous tissue of a bone, and form for itself a kind of chamber, in which it may be easily moved, but from which it is with great difficulty extracted.

Sometimes a ball will strike a bone longitudinally, and channel a long groove without fracturing the bone.

GRAPE SHOT produce wounds like those from round shot, only, as they are much smaller, so the injuries they inflict are less severe.

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* "A shot ricochetted with great force over one of the parapets, carrying away the cap from a seaman's head. The man was a little stunned, but no further mischief ensued. When his cap was picked up, it contained a handful of hair, which had been shaved from the scalp by the shot. This would have been a 'poser' for the old wind-contusionists." Account of the wounded in the recent bombardments of Sebastopol, by D. J. Duigan, Esq., Surgeon R.N., attached to the Naval Brigade.—Medical Times, Sept. 8, 1855.

Canister Shot likewise cause wounds similar, though not so severe as those from musket balls of the same size.

Small Shot, discharged from a fowling-piece or pistol, produce different effects, according to the distance at which they strike. If the distance is great, they will in all probability be scattered, and fall singly; *peppering* the victim smartly, but not penetrating beyond the subcutaneous tissue, nor doing much harm unless one of them strike the eye. But if the distance is small, so that they strike *en masse*, their effects are far more destructive than those of a bullet, for they spread *in* the flesh, and so cause greater laceration, besides the mischief arising from their lodgment in the tissues.

Although there may be no *ball* in a gun or pistol, yet the *wadding* may act as a ball, if the piece is discharged close to the body. The surgeon in civil practice who examines a gun-shot wound inflicted with intent to murder, should always save the wadding if he finds any, as it may afford a clue to the detection of the murderer. All gun-shot injuries, too, may be complicated with severe burns from the explosion of gunpowder.

Course of Balls.—In the passage of the ball everything is as a rule carried in front of it, and thus it is that we meet with fragments of the patients' clothing or pieces of wadding in the wound. If the ball in its course has already wounded one man, it may carry before it portions of his dress, or even spicula of bone, and lodge them in the body of the next. Yet it is remarkable how easily balls may sometimes be diverted from their course by the slightest obstacle. An officer in the engineers returning one evening from the trenches before Sevastopol, was struck in the abdomen by a musket ball. It first impinged against a button of his trousers, which it bent double. This served to change its direction, and instead of passing into the cavity of the abdomen, it travelled downwards between the abdominal muscles, and lodged deeply in the upper part of the thigh. Any trifling obliquity of surface, or difference of density in the parts which it traverses, may cause it to take a most circuitous route.

Thus a ball may enter on one side of the head, chest, or abdomen, and may pass out at a point exactly opposite, just as if it had gone entirely through the cavity. In such instances the ball has generally been guided by a ridge of bone; thus, in the chest it travels round the ribs, or in the abdomen around the crest of the ilium. Sometimes it will make a complete circuit, as in the case of a friend of Dr. Hennen, who was struck about the *pomum Adami* by a bullet, which passed completely round the neck, and was found lying in the very orifice at which it entered. In a similar manner balls will run along concave surfaces; thus a soldier may be struck in the wrist, when the arm is bent in the act of firing, and the ball may graze along the arm, and fly off at the shoulder: or a ball may enter the thorax or abdomen, glide along the inner surface of the peritoneum or pleura, and pass out or be lodged near the spine.

If a ball has passed through a part, an orifice of entrance and one of exit is usually found. *The orifice of entrance* is generally smaller than the ball, with its edge livid, and *inverted.* That of *exit* is a larger and more ragged opening, with its edge somewhat *everted.* The difference in appearance between the entrance and exit of the ball is, however, much modified by the speed at which the ball is travelling when it strikes the patient. The increased velocity with which the new rifles propel the balls, causes them to enter and leave a body without its offering sufficient resistance to produce a difference in the appearance of the two wounds. If, however, the speed of the ball's course be diminished, and a limb be then perforated by it, we have the characteristic appearances of its ingress and egress well marked.

The ball in its passage through a part leaves a track which is often indicated by a bluish or dusky-red line or wheal on the skin, or sometimes by a peculiar emphysematous crackling. Along this track the tissues are bruised and broken down, and their vitality greatly destroyed, and lying in different parts of it are the fragments of foreign bodies which the bullet may have carried before it.

SECTION II.—LODGMENT AND EXTRACTION OF BALLS.

LODGMENT OF BALLS.—It is always important to ascertain whether the shot has passed out of the body, or whether it has lodged; and supposing that there are two holes, it must be considered whether they are produced by the *entrance* and *exit of one*, or by the *entrance of two* distinct balls. If there are two holes, and they are distant from each other, some light may be thrown on the question by ascertaining the position of the patient at the time he was wounded, and the posture of his assailant. Thus, a soldier has presented himself with two shot-holes, one on the outside of the ankle, the other near the trochanter; but they were both caused by the same ball, which entered at the ankle when the foot was raised in the act of running.* In another instance, a soldier, who was ascending a scaling-ladder, was wounded in the right arm, and the ball was found under the skin of the opposite thigh.† But even though there may be but one opening, it by no means follows that the ball has lodged; for it may have escaped by the very hole at which it entered, after having made the circuit of the body. Or it may have impinged against some part, such as the cartilage of a rib, which has caused it to recoil; and a ball has been known to drive a piece of bone into the brain, and fall out of the wound afterwards. In some instances a ball has been unable to perforate a fold of linen, but has carried it for the distance of one, or even three or four inches into the wound; and on drawing this out, the ball of course comes out with it.‡

Again, it is very possible that two balls may enter by the same aperture, one of which may pass out, and the other diverge and wound some important organ. Sometimes it will happen that a ball splits, either from a defect in the casting, or from its striking against some sharp bony ridge, as the vomer, or shin, or edge of a fractured bone of the skull; and although one portion may have been extracted, another may be lodged and may have injured important vessels or nerves.

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* Guthrie, op. cit. p. 17. † Hennen, op. cit. p. 35.

‡ A silk handkerchief sometimes saves life in the same way; and Mr. Home, in his Report on Gun-shot Wounds in Canada, in 1838, speaks of the great power which the canvas lining of soldiers' stocks has in resisting the passage of musket-balls. Edinburgh Med. and Surg. Jour., July, 1840.

But it frequently happens, that large masses of metal are impacted in the substance of a part without much external sign of their presence, as in a case related at p. 133.

Extraction of balls and foreign bodies.—It is of the greatest importance for the future well-doing of the patient, that any ball or foreign particles which may have lodged should be removed by the surgeon. A most careful examination of the parts is always necessary. This should be made as soon after the injury as possible, before swelling and œdema of the tissues have come on. If the ball has traversed some distance, and it cannot be detected near the surface, a silver probe of about twelve inches in length is most useful, and will allow an exploration to be made along the track of the bullet. As a rule, however, the best examination is made with the finger, passed into the wound, which may be enlarged if required. When the ball is deeply lodged, a pair of Coxeter's bullet-forceps will be found of great service, their narrowness allowing them to pass down almost any bullet's track. When it is near the surface, a pair of straight incisor-tooth forceps will seize fast hold of a leaden ball and remove it with facility. If, however, the ball is lodged in bone, much difficulty is frequently experienced, and great tact is often required to get hold of it. A small channel may in some cases be made with a gouge in the bone, and with one of Bell's sharp-pointed tooth elevators the ball may generally then with tolerable ease be removed.

SECTION III.—COLLAPSE FROM GUN-SHOT WOUNDS.

COLLAPSE OR SHOCK is the first constitutional effect of a gun-shot injury. It follows immediately or soon after the infliction of the wound, and is present to a greater or less extent in nearly every case. It is more intense in proportion to the severity of the injury, and according to the part of the body which has suffered; but even comparatively slight wounds are often followed by a very great amount of collapse. Gun-shot injuries of the thorax and abdomen are always followed by severe collapse.

The severity of wounds in these localities, when the cavity is opened, or the viscera wounded, is sufficient to account for this; but in instances where the ball has not penetrated the abdomen or thorax, but merely traversed their walls, there is still usually some shock, and often very much. The cause is probably partly the fear which men have of the result of wounds of either of the large cavities, believing that if a ball strikes the thorax or abdomen the case is necessarily fatal.

Another reason has been attributed for the collapse which is so universal, which is this. Men are generally wounded whilst under fire, while the nervous energies are in a state of extreme tension. They are suddenly struck down, and rendered "*hors de combat*," and depression rapidly follows in proportion to the extent of the previous excitement, and thus we may meet with great collapse following even small injuries.

Mr. Matthew considers that the shock of gun-shot wounds differs from that state to which the term is applied in civil practice, in the peculiar mental condition, inasmuch as the depression which follows the high nervous excitement in which the men are at the time they are wounded, is superadded to the physical effects of the injury. He adduces, as proof of this, the fact that men were occasionally received for treatment in the Crimean hospitals before the excitement had subsided; and they seemed to bear the operations without chloroform well, and in some instances begged that it might not be given. The depressed condition may come on immediately after an injury, or, more rarely, it may not take place until some hours afterwards, a difference depending on the peculiar mental constitution and nervous development of the patient.

After severe gun-shot injuries patients may die from shock only. No large amount of blood may have been lost, or there may have been no destruction of parts which could cause rapid death, and yet the patient never rallies from the state of collapse, and speedily sinks. During the late war as many as 160 wounded men among the regiments of the line died within twenty-four hours, and 149 more within forty-eight hours after the infliction of their wounds, a very large majority of these deaths being due to this cause.

During the stage of collapse, the patient presents a blanched surface; the face pale, pinched, and anxious; the extremities cold; the pulse small, weak, often irregular and fluttering; the voice feeble. Such is the usual condition of the patient, varying of course in degree, when he is first seen by the surgeon. It is a question, therefore, of great moment whether it is best to rouse him from this state of collapse.

The nature of the wound must answer this question. If the ball has penetrated the thorax or abdomen, it is best not to attempt to rally him too soon; vessels may be wounded which it is impossible for the surgeon to secure, and this depressed state is most favourable for nature to form a coagulum, and arrest hæmorrhage.

The patient should be placed in bed, with his head low, and be carefully watched, in order, by the judicious application of stimulants, warmth to the feet, &c., to prevent the collapse proceeding to too great an extent; in fact, to save him from sinking from the effects of that which, if not carried too far, is most favourable for his ultimate recovery. The same rules apply to all cases where large vessels have been, or are supposed to be wounded.

When, however, the injury is superficial, or even when it is deep without affecting important vessels, the patient should be rallied from the shock he has received as soon as possible, as reaction is generally in proportion to the amount of depression.

SECTION IV.—HÆMORRHAGE FROM GUN-SHOT WOUNDS.

HÆMORRHAGE.—*Primary or immediate* hæmorrhage following gun-shot wounds, especially if they are severe, is of comparatively rare occurrence.

There may be some slight bleeding at the time the wound is inflicted, but not, as a rule, in any dangerous quantity. During the Crimean war there were frequent instances in which the upper or lower extremities were torn off by round shot or shell, and left hanging merely by the integuments, and yet, in the majority of such cases, no immediate hæmorrhage resulted which at all jeopardized life.*

After gun-shot injuries in which the blood-vessels are involved it is usually found that they are much lacerated, and retracted within their sheaths, and thus hæmorrhage is checked for a time. Occasionally cases occur where the femoral or some large vessel has been wounded, and hæmorrhage has rapidly proved fatal. In such instances, it is probable that the ball carried away a portion of the calibre of the artery, without entirely dividing it.

Intermediary hæmorrhage may occur some hours after the receipt of the wound, as soon as reaction begins, or after it has been thoroughly established.

In such cases if the application of pressure fails, the best treatment is if possible to cut down upon and secure both extremities of the bleeding vessels.

Secondary hæmorrhage, or that which takes place at a variable period from the fifth to the twenty-fifth day after the infliction of the injury, may be produced—

1st. By any sudden or violent movement of the patient, or anything which increases the rapidity of his circulation. The coagula which had temporarily closed the extremities of the wounded vessel, are pushed away by the force of the blood, and bleeding immediately takes place. Thus patients during the late war frequently died of *secondary* hæmorrhage in being conveyed from the camp to Balaklava.

2nd. It may happen from sloughing, or ulceration of a large vessel. The wounded tissues may ulcerate, or else may have been so much injured by the wound as to be incapable of recovering their vitality.

3rd. A vessel may be cut at almost any period after the injury, by a projecting sharp spiculum of bone.

4th. A peculiar hæmorrhagic diathesis is a frequent cause of secondary hæmorrhage.

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* In the 44th regiment, on the night of the 21st of June, 1855, a man had his left arm carried away at the shoulder-joint: the limb was completely separated from the trunk, leaving too little of the soft tissues to cover in the face of the stump. The axillary artery appeared to have bled but little, if at all, at the moment of injury, and there was no subsequent hæmorrhage. The laceration laid bare the artery and vein for full three inches of their course. The ends of the vessel for three-quarters of an inch were curved, plugged with coagula, and tapering to a point. The pulsation of the artery was full to the very base of the plug.

This diathesis is often produced in long campaigns from improper diet, such as a deficient supply of vegetable food, which causes scurvy in the men, and renders them liable to hæmorrhage from even very slight injuries. The blood thus wanting some necessary principle seems incapable of forming coagula sufficiently firm to seal the mouths of the divided vessels.

Treatment.—In all cases, if practicable, both ends of the bleeding vessel should be tied; since, if either end is left open, the circulation may be carried on through collateral channels, and hæmorrhage may return. The late Mr. Guthrie observes, in his Commentaries, that this should not be done unless the vessel bleeds, "as hæmorrhage once arrested may not be renewed." A case occurred in the Crimea under Mr. Matthew which shows that even this rule will not always be the best for the patient's welfare unless he can be kept under close observation, and free from disturbance.*

In wounds of the interosseous artery of the arm, owing to the difficulty in getting at the vessel situated beneath the deep flexors of the forearm, surgeons have been induced to tie the brachial in preference to the more difficult and tedious operation of securing both ends of the interosseous. Mr. Partridge in two separate cases tied the brachial at King's College Hospital for wounds of the interosseous, and in both instances the hæmorrhage was entirely arrested, and the patients did well. For similar reasons, in wounds of the palmar arch, it is better to tie both radial and ulnar; or should it be found that pressure on these fail to arrest the hæmorrhage, to proceed at once to tie the brachial, rather than explore beneath the palmar fascia for the cut ends of the bleeding vessels.

SECTION V.—GUN-SHOT INJURIES OF THE HEAD AND FACE.

GUN-SHOT INJURIES OF THE SKULL are the most unsatisfactory and fatal class of cases which it falls to the lot of the military surgeon to treat. To diagnose the extent of injury inflicted is often very difficult, and yet a correct appreciation of the nature of the wounds, and the parts implicated by them, is of paramount importance. Balls striking the skull usually cause fracture at the point they impinge against, and thus, cases of fracture of the base from *contre coup* are of rare occurrence in military practice.

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* A man was brought in on the evening of the battle of Inkermann who had been shot through the leg at the junction of the middle and lower thirds. He had lost a large quantity of blood, and it was evident that the posterior tibial artery had been wounded, but it did not then bleed. The exhaustion was excessive. He was placed in a tent, with a pledget of lint on the wound, the leg bandaged and kept elevated, and an orderly left to watch him.

On the following morning the pad of lint was removed, but no hæmorrhage took place. As the wounded had to be removed from camp to Balaklava, a distance of seven miles, and thence to Scutari by ship, it was thought best to tie the vessel, notwithstanding it could not be made to bleed after all the bandages were removed from the limb. The operation was accordingly done, and it was found that a large portion of the calibre of the vessel had been shot away. Probably had not this operation been performed, secondary hæmorrhage would have come on at some later period, and through the man's feeble condition have terminated fatally.

Simple flesh wounds of the scalp may be produced by the grazing of a fragment of a shell or musket ball. These injuries, if not severe, soon get well under simple dressing and quiet. If, however, there is much laceration of the scalp, suppuration and burrowing of pus is apt to occur, and death of a portion of the external table of the skull often results.

Treatment.—Perfect rest, and the avoidance of all excitement. The bowels should be freely opened by purgatives, and the patient kept on low diet.

Fracture of the skull without depression.—Cases of this nature are of frequent occurrence, but are of far more serious importance than the foregoing class of injuries. They are usually accompanied with considerable contusion or laceration of the scalp. The symptoms which such an injury produces are uncertain: in some instances the patient is rendered insensible immediately by the blow, while in others he is apparently but little affected by it at the time of its infliction. The wound should be carefully examined *with the finger*, to ascertain if there is any depression. Often, when merely a fissure can be detected in the external plate of the skull, an extensive stellated fracture may exist in the inner table. This is usually referred to a greater brittleness of the inner table, but Mr. Erichsen has shown, by reference to the case of a man shot through the head from the mouth, that the external table may be more extensively fractured than the internal one, when the ball impinges on it from within. The external plate may, in some cases, be grooved by a ball, imparting to the touch the sensation of a depressed fracture.

The prognosis in all these cases is necessarily unfavourable. yet very many patients will recover perfectly. The external table may exfoliate and healthy granulations and perfect cicatrization may follow.

In unfavourable cases extensive suppuration beneath the scalp may come on, or the inner table of the skull may die. and abscess between the dura mater and bone, with its concomitant evils, may destroy the patient.

Treatment.—If the case is clearly one of simple fracture without depression, but little medicinal treatment is required. Cold applications should be kept to the head, and the bowels regularly opened, if necessary, by purgatives. Perfect rest should be strictly enjoined. and all means of excitement avoided. If, however, abscess be diagnosed beneath the inner table, it should be evacuated by the removal of a portion of bone with the trephine. The period at which urgent symptoms set in after the injury will assist the surgeon in the formation of his opinion. The occurrence of severe rigors with head symptoms coming on from fifteen to thirty days after the injury, would give rise to a grave suspicion of the formation of pus.

Fracture of the skull with depression.—The symptoms of such injuries are so various, that it is impossible to lay down any correct laws to guide the surgeon in his diagnosis. In some cases the indications of compression of the brain are strongly marked, while in others the patient, when first seen, appears but little affected.

If symptoms be urgent, and there be much difficulty in arriving at a satisfactory conclusion, whether there is depression or not, the wound should be enlarged, so as to admit of a *visual* examination of the injured part. In very many instances surgical skill can avail nothing, and the surgeon has but to watch and soothe the dying man, and observe the curious physiological phenomena presented.*

Treatment.—If the usual symptoms of compression are present, and depressed bone be *positively* detected, and there is a scalp wound, the surgeon may trephine. If, however, on the other hand, the bone is found depressed, but no symptoms of compression be present, or if there be no scalp wound, the operation should be delayed until cerebral symptoms have begun to manifest themselves.

The operation of trephining is so fraught with danger, and experience has shown that men will recover sometimes unexpectedly from the most severe injuries, that unless there be *positive* indications for its use, it should not be had resort to.

If the scalp be wounded and the skull comminuted, and the spicula are pressing on the brain or its membranes, these should be immediately removed, *without* waiting for symptoms.

Compression of the brain from coagula of blood after injury to the skull is of not unfrequent occurrence.

In such cases trephining has been recommended; but the difficulty of diagnosing correctly the seat of the coagulum, supposing hæmorrhage really to have taken place, renders the operation very unsatisfactory, and one which should be seldom resorted to. Moreover, it should be noticed that Dr. Stromeyer, who was surgeon-in-chief in the Schleswig-Holstein campaign against the Danes, in 1849, protests strongly against the use of the trephine, even in cases of depression, urging that the admission of air must exert a deleterious influence on a contused portion of brain. From the campaigns of 1849 and 1850 he possesses the notes of forty-one gun-shot fractures of the skull with depression, and of these only seven terminated fatally; thirty-four were cured, of whom only one had been trephined.

Balls lodging in or penetrating the skull are almost always fatal. There was no instance during the Crimean war of a man recovering from such an injury. Many survived four or five days after severe damage to the brain, but all these cases were eventually fatal.

GUN-SHOT INJURIES OF THE FACE are of frequent occurrence, and present a greater amount of deformity than wounds in any other part of the body; nevertheless the issue of such cases, even when the bones are severely injured, is usually favourable, and a very large majority of the patients return again to duty.

During the Crimean war, out of 535 men treated for these injuries, during the second part of the campaign, only fourteen died, or 2·6 per cent., and 83 per cent. returned to duty. Any part of the face may have the integuments lacerated, or perforated, or the bones comminuted, yet we have not any vital organ interfered with. The parts are vascular, and it is their vascularity which accounts for the rapidity with which repair is carried on. The chief danger is hæmorrhage, but still, as there are no very large arteries, the bleeding usually ceases after a while.

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* A private of the 21st regiment in the Crimea, had the whole of the posterior half of the skull depressed by a round shot, yet he lived two hours. A private of the 89th regiment lived ten days after having, as it turned out at the post mortem, a piece of the skull driven into one of the corpora striata.

If the lower jaw be torn away, the tendency of the tongue to fall upon the glottis will be a source of inconvenience to the patient. In the case of a private in the 31st regiment, who was wounded on the 2nd September in the second attack on the Redan, the lower jaw was comminuted by a grape-shot, and the whole of it in front of the angles was removed in splinters by the surgeon. The tongue was apt to fall backwards on the glottis, and interfere with respiration. This defect the man used to remedy by drawing it forward with his finger, and by resting with his face as prone as possible. He ultimately recovered.

Two cases are recorded during the late war in which grape shot weighing nearly eighteen ounces had lodged in the back of the pharynx, having entered through the face, and breaking down all the tissues with which they came in contact. One patient was a private in the 1st battalion of the Royals, and was treated in the Castle Hospital, Balaklava. The second was a private of the 31st regiment.

Treatment.—Remove all loose spicula of bone, and adjust the parts as neatly as possible, covering them with some light water dressing. If the jaw be fractured, maintain it in position, either by the perforated wire or gutta-percha splint. The diet should be fluid, but good.

SECTION VI.—GUN-SHOT INJURIES OF THE CHEST.

GUN-SHOT WOUNDS OF THE CHEST may be divided into, 1st. Those in which the cavity of the thorax has *not* been opened.

2nd. Those in which the cavity has been opened; with or without injury to its contents.

In the first class the danger is less than in the latter. Yet severe contusion of the lung may result from a blow of a spent cannon-shot on the thorax; or life may be endangered from shell wounds causing severe laceration of the integument and injury to the ribs.

Among wounds of the second class it most commonly happens that a ball passes through the lung. Here we have a track through the substance of the lung, and generally pieces of the patient's dress, or fragments of wadding, are found to have been carried before the bullet in its course; vessels must be torn through, and hæmorrhage, often to a great extent, will take place at some period after the receipt of the injury. This bleeding may occur in the following modes:—

α. From the vessels of the *chest wall*.

β. From the vessels of the *lung*.

The former class (α) may be either, 1st, *external* through the wound; or, 2nd, *internal* into the cavity of the pleura.

The second class (β) may be *internal:* 1st. If slight, into the substance of the lung.

2nd. It may flow into one of the bronchi, and so be coughed up.

3rd. If more severe, it may be into the cavity of the pleura, compressing the lung, and adding much to the patient's sufferings and danger; or it may be *external.* Possibly old adhesions of the lung to the pleura may exist, gluing the costal and pleural surfaces together, or from other causes the blood may escape through the wound inflicted by the missile.

The lodgment of balls in the lung during the late war, owing to the use of rifles, was more rare than in former campaigns. The danger is much greater than when balls pass through the lung.

There are, however, instances of men having lived for many years with a ball in one lung. In such cases it becomes clothed with an adventitious cyst, and thus coated, seems no longer to act as a foreign body.

Symptoms of wound of the lung.—Great collapse; the face blanched and anxious; difficulty of breathing in proportion to the extent of the wound, and probably some bloody frothy expectoration. Frequently there is emphysema in the region of the wound, but this is by no means a necessary occurrence.

The Prognosis in all penetrating wounds of the chest is unfavourable, particularly if the ball has lodged.

Treatment.—The patient should be placed in bed, and the wound carefully examined, to ascertain whether the ball has lodged, or passed through the thorax; and when no counter opening can be found, it will often be detected lying beneath the scapula on the opposite side. The patient should not be roused from the state of collapse, if it be not severe; a piece of light dressing should be placed on the wound, and he should be carefully watched, and the symptoms treated as they present themselves.

If the surgeon has reason to believe that hæmorrhage is going on into the pleura, *free venesection* should be had resort to, sufficient to induce syncope and favour the formation of a clot. If *external* hæmorrhage is taking place there is no need of venesection, as sufficient blood may be lost to produce the required effect. Much has been said lately concerning the necessity or advisability of bleeding men simply because they have received a chest wound. The late war in the Crimea seems to point out that large bleeding for the arrest of the inflammatory action which follows gun-shot injuries of the chest, is injudicious.

Adhesive inflammation along the track of the bullet is desired, and is absolutely necessary for the purpose of limiting the inflammatory action to the wounded part. By largely bleeding the patient, suppuration is induced, and general, instead of local pneumonia is the result.

A low diet, perfect rest, anodynes, and diaphoretics seem to afford the patient the best chance of recovery, if he escape the first danger from hæmorrhage. The position of the patient should be that which is most comfortable, as that will probably be the one which is most favourable for his recovery. On the wounded side is generally selected, as that position favours the discharge of matter, approximates the opposed surfaces of the pleura, and quiets the movements of the ribs on the affected side.

Complications and unfavourable symptoms.—Suppuration must always take place along the track of the bullet. It may be profuse, and the patient may sink under it. Severe pneumonia or pleurisy may add to the danger. A very frequent cause of death after these injuries is empyema, or the secretion of pus from the entire surface of the pleura.

SECTION VII.—GUN-SHOT INJURIES OF THE ABDOMEN.

GUN-SHOT WOUNDS OF THE ABDOMEN form a very fatal class of injuries. During the Crimean war 235 cases were treated, and of these 55·7 per cent died.

They may be divided into—

1st. Flesh wounds of the walls of the abdomen.

2nd. Injury to the internal organs without lesion of the walls.

3rd. Penetrating wounds, with or without injury to the viscera or large vessels.

1st. *Flesh wounds of the walls of the abdomen* may be caused by fragments of shell, by which large portions of the integuments and muscles are often torn away, and portions of the intestines sometimes exposed. Bullets will frequently traverse the abdominal walls without penetrating. No protracted examination should be made by the surgeon in such cases; but failing to detect the true nature of the wound, he should leave it for time to decide whether the cavity has been opened, or the viscera wounded.

2nd. *Injury to internal organs without lesion of the abdominal walls.*—Spent round shot or spent fragments of shell may strike the abdomen and inflict severe injury on the parts within, *without* wounding the walls of the abdomen. The liver, kidney, or spleen, or even the intestines, may be thus ruptured. The condition the abdominal muscles are in at the time the blow takes place will often determine the amount of injury. If they are perfectly relaxed at the time, the damage inflicted on the internal organs is usually severe, as no resistance is offered to the violence of the missile; whereas, if the abdominal muscles are rigid, they oppose the ball, and its impetus is expended in overcoming this opposition.

3rd. *Penetrating wounds of the abdomen with or without injury to the viscera or large vessels.*—The fatality which follows such injuries is very great. When the ball merely penetrates the wall and passes out of the abdomen *without* injuring its contents, the chief danger to the patient is from peritonitis. When, however, the viscera have been wounded the severity of the danger will, in a great measure, depend on whether it is one of the solid organs, as the liver, spleen, or kidney, which has been injured, or whether there has been perforation of the stomach or intestines. From the reports of cases, wounds of the liver, spleen, and kidney appear more fatal than those of the hollow viscera; and wounds of the stomach and large intestine more fatal than those of the small.

Symptoms.—The position of the wound is a great guide as to whether the abdominal cavity has been opened; but as it is often impossible to tell by a mere examination, the surgeon is frequently obliged to found his diagnosis on the symptoms present. Great collapse is the first striking symptom; if the viscera have been wounded, it is very severe, indeed it is a common cause of death in wounds of this region. When death does happen from shock, it is usually found that the intestines have been largely ruptured, or there has been internal hæmorrhage. Frequent vomiting is a symptom which is common in wounds of the intestine, particularly if the injured part be high in the alimentary canal. There is usually pain in the abdomen, and frequently passage of blood by the stools. The after symptoms, or those which manifest themselves at some short period after the infliction of the injury, are referrible, 1st, to peritonitis, and 2nd, to those resulting from the organ or viscera which may have been wounded; thus, the passage of blood by the urine, or the escape of urine from the wound, or of bile, or, indeed, of any special secretion, will indicate at once the organ which had suffered. Protrusion of the intestine through the wound is of *very rare occurrence.*

Treatment.—Having carefully examined the wound *without* much manipulation, place the patient in bed.. He should not be hurried from the state of collapse, unless it be so severe as to threaten a fatal termination. Should it be ascertained that the intestine is wounded, do *not* search after the wound with the view of sewing up the opening; for if the wound is *small* the protrusion through it of the mucous membrane is usually sufficient to arrest for a while the flow of the contents until lymph seals up the opening. Few cases occurred during the Crimean war in which ligatures were used, and those were fatal.

Large and repeated doses of opium are imperatively called for to relieve the pain, and to arrest the peristaltic action of the bowels; it serves also to quell the mental anxiety of the patient. The question of general bleeding must be determined by the surgeon. He should remember that it does not follow that because a man is wounded in the abdomen therefore he must be bled. In injuries of this region adhesive inflammation is earnestly desired. Prophylactic bleedings are believed by most surgeons of the present day to be positively injurious; and it is generally considered that it is sufficient to meet actively an evil when it presents itself without submitting a patient to powerful remedies in anticipation of a mischief which may never occur.

Occasionally cases have been met with in which a ball after penetrating the abdomen has been lodged in the bladder. M. Baudens removed a ball from the bladder by the operation above the pubis, and the late Mr. Guthrie succeeded in getting one away by the lateral operation. Mr. Dixon* relates ten cases in which balls were successfully removed from the bladder, and three in which the attempts failed. Instances are also on record of balls having been passed by the bowels at stool, proving that they must have lodged in the intestine.

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* Med. Chir. Trans., vol. xxxiii.

SECTION VIII.—GUN-SHOT INJURIES OF THE LIMBS—AMPUTATION. PRIMARY AND SECONDARY.

GUN-SHOT WOUNDS OF THE EXTREMITIES are met with more frequently than wounds in any other region of the body. Both the upper and lower extremities are liable to similar wounds, but the danger is far greater in wounds of the latter. We may have—

1st. *Flesh Wounds,* caused either by the passage or lodgment of balls, without producing any fracture of the bones, or injury to any important vessels or nerves; or they may be produced by fragments of shell. The injury inflicted by a bullet is not usually very severe, and under simple dressing may soon get well.

The damage, however, which results from fragments of shell, often ends in severe sloughing and loss of parts, producing, if the patient survives the drain, great deformity from the contraction and cicatrization of the tissues which have been involved; for example, after wounds of the calf of the leg, in which there has been loss of a large portion of the gastrocnemius.

2nd. *Simple Fractures* are usually caused by spent balls; and although, in such cases, the integument may not have been broken, still sloughing often follows from the contusion.

3rd. *Fractures with destruction of a portion of the integument* are produced—

(1st.) By balls penetrating the limb and striking the bone.

(2nd.) By fragments of shell which may produce severe contusion and laceration of the integuments and muscles, and fracture of the bone.

(3rd.) Fractures are often caused by large stones, which have been struck and set in motion by round shot, or fragments of shell. Fractures produced in either of these three ways are always compound and very generally comminuted. The conical ball may occasionally lodge in the bone without fracturing it, but as a rule, it breaks it into many fragments, or else, in passing through, it splits it for some distance up the shaft.

In the passage of the ball or fragment of shell, large vessels or nerves may be divided, adding much to the severity and danger of the injury.

4th. The whole limb may be torn away by a round shot or shell, and be left hanging merely by the integuments. Such cases are very fatal. They produce fearful collapse, from which frequently the patient never rallies.

Treatment.—Simple flesh wounds, if not severe, require but little surgical aid. Foreign bodies should be removed, and the parts covered with a little water-dressing. If, however, they should slough or ulcerate, they must be treated accordingly.

Fractures.—If the fracture be a simple one, caused by a spent shot, without much injury to the superficial or deep tissues, the limb should be put up in a splint, and every endeavour made to save it; but if there is severe contusion and destruction of the deep structures, amputation should be resorted to. It should be re membered that in field practice the military surgeon does not enjoy the same opportunities for treating fractures which the civilian does. Men who have been wounded have to be transported to the secondary hospitals for further treatment, or perhaps carried some distance on a march; and as it is the duty of every surgeon to look first to the safety of the life of his patient, he will frequently have to sacrifice a limb, which, under more favourable circumstances, he would endeavour to save.

Compound comminuted fractures of the lower extremity in the majority of cases call for amputation.

The *upper* is capable of sustaining and recovering from injuries which would prove fatal or require amputation in the lower extremity. The bones of the humerus or forearm may be comminuted; but unless the integument is either severely lacerated, or torn away, or large vessels or nerves injured, the surgeon should endeavour to save the limb.

The splintered and loose portions of bone should be removed, and the sharp projecting extremities cut off, and the case then treated as an ordinary compound fracture. Frequently, after severe comminution of the bones of the humerus, a large portion will die, but this may either come away of itself or be removed afterwards by the surgeon, and yet a useful arm may be preserved. John Bryan, of the 20th regiment, was wounded at the assault on the Redan. More than an inch of the thickness of the humerus was removed on the 6th August, yet good union followed with little loss of power of the limb. In the *lower* extremity the shock and effects of injuries on the constitution are more severe, and they are attended with great danger to life; and this danger increases the nearer the injury approaches the trunk, wounds of the upper third of the thigh being far more fatal than those in the lower third. Amputation is frequently called for, and it should be remembered that the danger of amputation of the lower extremity is in an increasing ratio for every inch of the limb which is taken away. This applies especially to the thigh. Thus we find in the Crimean returns the following—

Amputations.		Total.	Died.	Ratio of Mortality per cent.
Amputation of hip.		7	7	100·0
Thigh	Upper third .	38	31	86·8
	Middle third .	56	31	55·3
	Lower third .	46	23	50·0
	Leg	89	28	30·3
	Ankle joint .	9	2	22·2
	Medio tarsal .	7	1	14·2

THE CASES REQUIRING AMPUTATION are,

1st. Those in which the limb has been torn away by a round shot or shell.

2nd. Severe laceration of the integuments, with injury to both artery and vein, even though the bone be uninjured.

If the artery only is wounded, both ends of it should be tied and an endeavour made to save the limb; but if both vein and artery have been torn, the injury is generally so severe that it is best to amputate.

3rd. Severe compound and comminuted fractures, with destruction of the surrounding tissues, even though the vessels and nerves be not injured, demand amputation.

Primary or Secondary amputation.—By the term *primary* is understood an operation performed within forty-eight hours after an injury, and before fever and inflammatory symptoms have set in.

Secondary amputation is that which is delayed until inflammatory symptoms have subsided and suppuration established.

The experience of modern surgeons has decided that amputation, when necessary, should be *primary*. The late Mr. Guthrie found that the loss after secondary operations was at least three times as great as after primary. The experience of the surgeons in the Crimea corroborated this fact to a great extent. The result of the primary and secondary operations during the second period of the late war is seen in the following table, which is copied from the Crimean returns.

	Primary Operations.			Secondary Operations.		
	Total.	Died.	Ratio of Mortality per cent.	Total.	Died.	Ratio of Mortality per cent.
Amputations of all kinds .	690	175	25·3	89	38	42·7

The patient should, if practicable, be allowed to recover from the state of collapse. Too early an operation is liable to be attended with even worse results than one at a much later period. If, however, there is hæmorrhage, or any cause which is likely to prolong the collapsed state of the patient, the operation should be performed as soon as possible.

GUN-SHOT WOUNDS OF JOINTS form a class of cases of peculiar interest, inasmuch as they often allow the principles of conservative surgery to be carried out in the treatment of them. Such injuries to the joints of the *lower* extremities are of more serious import than those of the *upper*. In the former the joints are larger and the danger to life seems to be in a great measure in proportion to their size.

Joints are sometimes severely injured, without any wound of the integuments covering them; thus in cases where the knee has been struck by spent round shot, inflammation, perhaps terminating in suppuration, may follow.

Fragments of shell or bullets may lay open a joint, causing, at the same time, severe destruction of the soft tissues, and perhaps fracturing or splintering the bones which enter into the formation of it.

When a ball has lodged in the extremity of one of the long bones, near a joint, a fissure will often extend into the joint. In the case of a man who was shot accidentally in the streets of Balaklava, by a soldier who was firing at a fierce bullock, the ball lodged in the upper part of the tibia. With some difficulty it was removed, but severe inflammation and suppuration of the joint followed, which terminated in the death of the patient. On the post-mortem examination it was found that a fissure extended into the joint. Occasionally bullets will pass through a joint, grooving, perhaps, the articular cartilage. Cases of this nature are most severe, and are more dangerous than those in which the joint has been more fully exposed, as in shell wounds.

Secondary implications of joints.—Joints are very frequently implicated, secondarily, from the inflammatory action set up by wounds in the neighbourhood extending to them, and involving them in its destructive effects. Private Waldron, 2nd battalion Rifle Brigade, received a bullet-wound over the left knee. The wound appeared superficial, and the joint not to be penetrated, but low chronic inflammation of it set in, and was followed by gelatinous degeneration. The limb was ultimately amputated, and the joint found quite disorganized.

In cases of pyæmia, secondary deposits of pus may take place in any of the joints. In such, free and early incisions seem to afford the best chance to the patient.

Treatment.—In injury of joints, especially of the large ones, and if the damage done be severe, the question of treatment becomes, in truth, one of amputation or excision.

Wounds of the large joints produce such fearful constitutional effects, that it is best not to attempt to save in them, but to resort at once to operation.

It must be recollected that in campaigning great difficulty is experienced in treating cases of excision, particularly those of the lower extremity. The patient has to be shifted perhaps two or three times from one hospital to another (such was the experience of the Crimean campaign), and therefore that most important element, rest, is wanting.

In injuries of the upper extremity, excision was frequently performed during the late war, and was attended with very good success. Out of thirteen cases of primary excision of the elbow-joint, only three died; and of eight cases of primary excision of the head of the humerus, only one died.

The best modes of performing the operations of excision will be seen under the heading "Excision of Joints" in another portion of the book. It may, however, be here mentioned, that, in performing the operation of excision, great aid will be given to the operator by using Mr. Fergusson's lion forceps to seize hold of the articular extremities of the bones before proceeding to saw them. The great use of this forceps was exemplified in the following case. A private in the 50th regiment in the Crimea was struck by a round shot in the upper third of the thigh, fearfully lacerating all the tissues and comminuting the femur as high as its neck. Amputation of the hip was performed, by Surgeon-Major Trousdell and Mr. Lawson, the head of the femur, which was separated from the shaft, being with facility turned out of its socket by the aid of this forceps, a proceeding which would have been almost impossible without them.

In all operations for gun-shot injuries, chloroform will be found a most useful adjunct. It not only deprives the patient of all pain during the search for balls and foreign bodies, which is often a most tedious proceeding, but it serves to quell, to a great degree, the mental anxiety which is generally present. The patients awake refreshed from a sound sleep, free from injurious excitement, and animated with a hope that what has been done for them will lead to their ultimate recovery.

CHAPTER IV.

EFFECTS OF HEAT, BURNS, AND SCALDS.*

DIVISION.—The most useful division of burns, for practical purposes, is the threefold one which has existed from time immemorial, into, 1st, burns producing *mere redness;* 2ndly, those causing *vesication;* 3rdly, those causing *death of the part burned.*

1. The first class are attended with mere superficial inflammation, terminating in resolution, with or without desquamation of the cuticle. The pain is philosophically said to consist of a perpetuation of the original sense of burning.

2. In the second class there is a higher degree of inflammation, causing the cutis to exude serum and form vesicles. These in trivial cases dry up and heal; but if the injury to the cutis has been sufficient to cause it to suppurate, they will be succeeded by obstinate ulcers.

3. The third class of burns is attended with mortification from disorganization of structure. These are, for obvious reasons, not attended with so much pain as the last class; but in every other respect they are infinitely more serious, and the sores which remain after the separation of the sloughs are often months or years in healing.

CONSTITUTIONAL SYMPTOMS.—The constitutional symptoms of severe burns are those of great collapse. The surface is pale, the extremities cold, the pulse quick and feeble;—there are violent and repeated shiverings, and the patient often complains most urgently of cold. In some fatal cases these symptoms are soon succeeded by laborious breathing, coma, and death; in others, dissolution is preceded by a period of imperfect reaction, with delirium, and sharp jerking pulse.

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* Sir C. Blagden and Dr. Fordyce found that they could expose themselves to air heated above 212 degrees without injury; and that they could bear the contact of heated spirits when cooled down to 130 degrees; of oil at 129; water at 123; quicksilver at 117. Vide Phil. Trans. vol. lxv.

PROGNOSIS.—*Extensive* burns, even of small severity, are always dangerous; and especially if vesication has occurred early, and the cuticle has been stripped off. *Burns on the trunk* are always more dangerous than those of an equal extent on the extremities. With regard to the *symptoms actually present*, it may be noticed, that although the severe pain, such as is common in burns of the second class, is in itself a source of great danger, from its tendency to exhaust the vital powers, still that it is on the whole a favourable symptom, if the injury is extensive; and that apathy and stupor indicate urgent peril.

The *periods of danger* in burns are three: 1st, during the first five days, from collapse or imperfect reaction; 2ndly, during the sympathetic fever which follows, in which the patient may sink with an affection of the head, chest, or abdomen; 3rdly, during the suppurative stage, in which he may die from the profuse discharge or from pulmonary consumption induced by it. Kentish observes that very many cases prove fatal on the ninth day.

MORBID ANATOMY.—A *post-mortem* examination readily accounts for the coma and laborious breathing, which are such constant symptoms of fatal burns. Congestion and serous effusion are found on the surface and in the ventricles of the brain; and the air-cells of the lungs are loaded with a thin muco-serous fluid, as in the "*suffocative catarrh of the dying*" of Laennec. Moreover, it has been shown by Mr. Curling,* that severe burns in young people may be followed by an acute ulceration of the duodenum, liable to terminate fatally by perforating the intestine and causing peritonitis, or by opening some large artery and causing effusion of blood, part of which may be evacuated by vomiting and purging. Mr. Murray Humphrey has observed ulceration of the lower part of the œsophagus.

TREATMENT.—The treatment of burns in their early stage has been a matter of great dispute. Some eminent surgeons † have advocated ice or other cooling applications; others, the use of turpentine and other stimulants, which latter plan of treatment was advocated by Mr. Kentish, of Newcastle, at the beginning of the present century.

The following, however, seem to be the *principles* of treatment deducible from the conflicting theories and practices which have been proposed, viz.:—1st, that the first applications should be of a mildly-stimulating nature; 2ndly, that after the first two or three days they should be soothing; till, 3rdly, slight astringents may be applied to expedite the healing; and, 4thly, that the part should throughout be most carefully preserved from the atmospheric air and from cold. If these principles are held in view, the surgeon will have no difficulty in finding appropriate remedies.

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* Med. Chir. Trans. vol. xxv.; Humphrey, Association Journ., Oct. 19, 1855.

† Earle's Lectures on Burns, Lond. 1832.

Local Treatment of minor cases.—The vesications may, if tense, be pricked with a needle, and the whole part be covered with lint soaked in *Carron oil*; that is, a liniment of equal parts of oil and lime-water, and then be wrapped in soft cotton wool. After the first two days poppy lotion, or the water-dressing, F. 121, may be applied on lint covered with oil-silk; or a poultice of bread and water, till suppuration is established; the chalk ointment, or zinc lotion, may be applied afterwards till the cure is complete. The part should be kept thickly wrapped in cotton wool during the whole period, to preserve it from the air and from cold or injury.

Of severe cases.—When a burn is severe or extensive enough to cause danger to life, Kentish's plan of first bathing the burnt parts with tepid turpentine, then with all possible expedition applying a liniment composed of *ung. resinæ* ℥j; *ol. terebinth* ʒss, thickly spread on lint, and lastly, wrapping them up warmly in cotton or flannel, seems to be the most judicious. These dressings should be allowed to remain as long as possible, and should not be removed unless there is a profuse discharge or bad smell from the wound. Great care should be taken, when the wound is first examined, not to strip off the cuticle. whilst taking off the patient's clothes.

Constitutional Treatment.—If there is an urgent degree of collapse (see Part I., Chapter I.), brandy and beef-tea must be given.

If there be much pain it should be quelled by opium. Children are commonly said *not* to bear opium well, but this is a vulgar error; they bear it well if there is adequate reason. The writer has administered ♏ x of Battley's sedative. in divided doses every night for a fortnight to a child of three years old, who had been badly burned, besides putting the child daily under chloroform whilst the wound was dressed. If the child is out of pain, or drowsy, of course there is no need for opium; and in all cases it should be given in the smallest doses that will suffice.

The bowels must be kept open by castor-oil or rhubarb; and the diet be plain, but not too low. In the event of any inflammatory or congestive attack of the head or chest, purgatives and leeches or bleeding must be cautiously employed, according to circumstances. If there is any tenderness under the right hypochondrium, or vomiting, or other sign of irritation of the duodenum, the diet should be of the blandest description, and small doses of hyd. c. cretâ and henbane be administered.

Treatment of the remaining Ulcers.—The ulcers resulting from burns are often extremely intractable. The granulations are pale, flabby, and exuberant; they secrete pus profusely; and many months often elapse before they are healed. The cause of this disinclination to heal is not well understood; but one cause there is which may be easily detected and remedied, namely, too full a diet, which is often needlessly used on the plea of supporting the strength under the profuse discharge. "There can be no doubt," says Kentish, "that full diet and stimulants, during the suppurative stage, keep up irritation in the system, and cause the immense continued discharge by the exposed surfaces of the wound."* And it is equally certain that many cases will rapidly get well when the diet is lowered and purgatives are administered. The binding down of the edges of the ulcer to the condensed tissue beneath is another cause of delay.

There should be no hurry in removing the first dressings; but when they are removed, the succeeding applications must be suited to the state of it.

If the ulcer is irritable and painful, or hot and swelled, or seems inclined to spread by ulceration, or if small abscesses threaten to form under the skin, poultices, or water-dressing, or F. 121, Dover's powder at bed-time, and aperients should be resorted to. If sloughs are tardy in separating, the case must be treated like the sloughing ulcer.

When the irritable state is removed, a succession of mild stimulants and astringents will be advisable: especially the zinc lotion; chalk, bismuth, zinc, or calamine ointment; simple lint; and pressure with sheet lead or strips of plaster. When the discharge is very profuse, the sore should be constantly kept thinly covered with very finely-powdered chalk.

Treatment of the Cicatrix.—The cicatrix of severe burns is very liable to become excessively hard, dense, and cartilaginous, and to contract in such a way as to occasion the most serious deformities. Thus, the eyelids or mouth may be rendered incapable of closing; the chin may be fixed to the breast, or a limb be rigidly and immovably bent. This contraction may, perhaps, be sometimes successfully opposed by keeping up extension with a splint, or, if the neck is the part burned, by making the patient wear a stiff collar, and by frequently moving the part during cicatrization; and the cicatrix may be lubricated with pure oil. If the fingers are severely burned, lint should be interposed between them, and they should be kept apart as much as possible, although it will be very difficult to prevent them from adhering together.† In burns of the head or face, the edges of the ulcer may be drawn asunder by strips of adhesive plaster. When any of the orifices of the body are involved, they should be kept dilated with canulæ, or plugs of oiled lint. But if, notwithstanding every precaution, the cicatrix contracts, and produces deformity, or prevents any necessary motion, the knife should be resorted to. Sometimes the whole cicatrix may be extirpated, the wound being treated by water-dressing, and the parts kept in a proper position during the cure. Sometimes an incision may be made in the sound skin on each side so as to form gaps, which will be filled with new and more pliant cicatricial tissue. Sometimes it will be useful to divide the cicatrix transversely by several incisions, at the same time dissecting it up from the parts beneath if it firmly adheres to them. But it must be remembered that operations which interfere with large portions of skin are very dangerous to life; and that the subcutaneous method should be employed where practicable. And, lastly, there is a plan which has been adopted with success by Dr. Mütter, an American surgeon, of dividing the cicatrix, dissecting it up, where adherent, and even dividing any muscular fibres in order to liberate the parts completely, and then filling up the gap by means of a Taliacotian operation; that is, by transplanting a portion of sound skin from some neighbouring part.*

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* Second Essay on Burns, Newcastle, 1800, p. 64.

† Vide Part IV. chapter xxiv.

CHAPTER V.

THE EFFECTS OF COLD.

I. Effects of Severe Cold.—When a person is exposed to very severe cold, especially if it be accompanied with wind,—or if it be during the night,—or if he have been exhausted by hunger, watching, and fatigue—he feels almost an irresistible impulse to sleep, which, if yielded to, is soon succeeded by coma and death. During the state of coma, the body of the sufferer is found to be very pale and cold: the respiration and pulse almost imperceptible, and the pupils dilated; but the limbs are flexible as long as life remains, unless the degree of cold be very great indeed. On a post-mortem examination, the chief morbid appearances observed are great venous congestion and serous effusion in the head.

II. Frost-bite.—But if the trunk of the body be well protected, the cold may affect some exposed part only, such as the nose, ears, or extremities. The first visible effect is, that the part becomes of a dull-red colour; an effect of cold which is notoriously frequent, and which depends on a diminution of the quantity of blood conveyed by the arteries, and a stagnation of it in the veins. If the cold continue, the venous blood will be gradually expelled by a contraction of the tissues, and the part will become of a livid, tallowy paleness, perfectly insensible, and motionless, and much reduced in bulk. When in this condition, a part is said to be *frost-bitten.* The patient may be quite unconscious of the accident that has befallen him until he is told of it by some other person; especially if it be his nose or ear that is affected, or some other part that he does not move.

It was shown by Hunter that the ears of rabbits and combs of cocks may be frozen so as to be quite white and hard and brittle, and yet recover with proper care. And some of the lower orders of animals may be entirely frozen and yet survive. But it is not credible that a whole limb of a human being, much less that the whole body, could be frozen without death ensuing—although stories of such occurrences have long been current amongst authors.*

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* Vide Earle's Lectures on Burns, Lond. 1832; Dupuytren, Clinique Chirurg.: Mütter on Deformities from Burns, in the American Journ. of Med. Sc., July, 1842. Several successful cases by Mr. Parker, of Bridgewater, are quoted in Ranking's Half-yearly Abstract, vol. iii. p. 106.

The indications are to promote reaction, but to avoid too sudden a transition from one extreme to the opposite.

Of Frost-bite.—The best remedy for a frost-bite is to rub the part well with snow. After a time cold water may be substituted for the snow, and the friction may be rendered brisker. These applications must be made in a room without a fire; and a high or even a moderate temperature must be avoided for some time. By these means no other inconvenience will ensue, save slight swelling and tingling, with vesication and desquamation of the cuticle; although the part will remain weak and sensible to cold for some time.

For the *coma induced by cold* the best remedy is friction with flannel all over the surface of the body; the patient should be put to bed in a room of moderate temperature, ammonia and weak wine and water be administered, and, provided the breathing is restored, a warm bath may be given.

The *contact of any intensely-cold body* (such as frozen mercury) causes severe burning pain, followed by vesication. It thus appears that the effects of sudden abstraction may be similar to those of too great communication of heat. The best application is ice gradually permitted to thaw.

III. GANGRENE may be caused if cold be applied continuously to the extremities, especially of ill-fed persons; hence the frequency of gangrene of the feet (*gelatio*) amongst the starved soldiers in the Crimea. It may be caused, too, if heat be injudiciously applied to frozen or frost-bitten parts. It may also ensue if a part has been exposed for a long period to a *low temperature* which is *suddenly raised*: although the cold may not have been sufficient to cause actual frost-bite, and may have been tolerated without inconvenience. A good example of this accident is narrated by Baron Larrey,† as it affected the French troops during their campaign in Poland in 1807. During the few days preceding and following the battle of Eylau, the cold was most intense, ranging from ten to fifteen degrees below the zero of Reaumur.‡ But although the troops were day and night exposed to this inclement weather, and the soldiers of the Imperial Guard, in particular, were nearly motionless for more than twenty-four hours, there were no complaints of its effects. On the night of the 9th of February, however, *a sudden thaw commenced*, and immediately a great number of soldiers presented themselves at the "*ambulances*," complaining of severe numbness, weight, and pricking pain in the feet. On examination, some were found to have slight swelling and redness at the base of the toes and dorsum of the foot; whilst the toes of others had already become black and dry. And in this manner, the toes, and sometimes the whole foot perished. One case, exactly similar, was treated by Mr. Solly in St. Thomas's Hospital in 1845. The patient, not very temperate, had been employed a whole day in January in handling raw cow-hides. In the evening, feeling his left hand excessively cold and stiff, he put it into warm water, and held it to the fire, which excited great pain and inflammation, ending in gangrene. which spread up to the middle of the fore-arm.* The best *treatment* for such cases is the application of snow or very cold water, followed by evaporating lotions. These, if employed early enough, may prevent gangrene; or even if that have actually occurred, they should be used as long as it appears to be spreading. Subsequently, the part should be wrapped up in resin ointment and cotton wool, and not be disturbed more than is necessary for cleanliness' sake; in most respects, the treatment of senile gangrene should be followed.

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* See an account of some experiments on the revival of toads after freezing in the Lond. and Ed. Journ. Med. Sc., Feb. 1843.

† Med. de Chir. Mil., tom. iii. p. 61.

‡ From 20 to 25 degrees below the freezing-point of Fahrenheit.

IV. CHILBLAINS consist in an atonic inflammation of the skin, induced in delicate persons by sudden alternations of temperature; such as warming the feet and hands by the fire when cold and damp. They may present themselves in three degrees. In the *first*, the skin is red in patches, and slightly swelled; with more or less itching or tingling, or perhaps pain and lameness. In the *second*, there are vesications—the skin around being bluish or purple. In the *third* degree there is ulceration or sloughing.

Treatment.—Friction, with stimulating liniments, such as F. 146; or liniment of turpentine, or of camphorated spirit, is the proper remedy. In most cases, port wine, bark, and cod-liver oil will be of great service.

If there are *vesications*, care must be taken not to break them; and the liniment must be applied lightly with a feather.

If there are *ulcers* or *sloughs*, and they are attended with much heat, pain, and irritation, poultices are required. But as a general rule, poultices are too relaxing; and stimulating ointments or lotions (such as *ung. resinæ, calaminæ, zinci*, &c.) should be preferred.

CHAPTER VI.

THE EFFECTS OF MINERAL AND VEGETABLE IRRITANTS.

OF these substances, some appear to act by their power of combining with, or of decomposing, the animal textures. Of others, especially the vegetable poisons, the reason of their hostility to animal life has yet to be discovered.

I. ACIDS.—This decomposing agency of the concentrated acids appears to depend mainly on their affinity for water. The *sulphuric acid* blackens or *chars* the tissues in destroying them; that is, separates the water and other constituent elements, and sets free the carbon. The *nitric* turns them permanently yellow. The *hydrochloric* leaves a dead white stain. The *hydrofluoric* "is, of all known substances," says Turner, "the most destructive. When a drop of the concentrated acid of the size of a pin's head comes in contact with the skin, instantaneous disorganization ensues, and deep ulceration of a malignant character is produced."* *Phosphorus* seems to act by the heat disengaged in its combustion.

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* Quoted in South's Chelius, vol. i. p. 128.

Treatment.—After injury from any of these acids, the first thing to be done is to wash it away, and neutralize it by repeated ablution with warm soap and water, with a little carbonate of soda; then to apply poultices or any simple dressings to the ulcers that remain. The pain of these injuries is greatly increased by cold.

II. ALKALIS AND CAUSTIC EARTHS.—These, like the acids, appear to destroy animal matter by combining with its water. They also form a soap with the fat. Caustic potass, in the form of *liquor potassæ* and quicklime, are the substances of this class which most frequently give rise to accidents. The *liquor ammoniæ* produces almost instant vesication and great pain when it touches the skin; it is, therefore, much to be prized as a speedy and efficient counter-irritant.

Treatment.—Ablution with weak warm vinegar and water, followed by poultices and simple dressings.

III. METALLIC COMPOUNDS.—The *bichloride of mercury* acts by its tendency to combine with albumen; and the *chloride of zinc* and *chloride* (or *butter*) *of antimony* probably produce their cauterant effects in a similar manner. The *nitrate of silver* is remarkable for the superficiality of its effects. It may vesicate the skin, or destroy a film on the surface of a sore, but its action does not spread. It suffers decomposition at the moment of its contact with the animal tissue; its acid appearing to be separated, whilst the metallic oxide combines and forms a white crust with the animal matter: and this soon becomes black, because the silver loses its oxygen, and is reduced to the metallic state.

Treatment.—The bichloride of mercury is rendered inert by white of egg mixed with water; the chloride of antimony is decomposed by water; the nitrate of silver by common salt; and the chloride of zinc by a solution of alkaline carbonate. These, therefore, would respectively be the proper applications for external injuries caused by these metallic compounds; although such cases very rarely come under the surgeon's cognizance.

Arsenic, locally applied, not only produces inflammation, or sphacelus, but may also be absorbed into the circulation, and produce its ordinary constitutional effects as well. The *surgical treatment* of any local injury from this mineral must consist in removing it as much as possible by ablution with lime-water, or with water holding the hydrated peroxide of iron in suspension, and then applying fomentations, or whatever other dressings may be most appropriate.

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* Elements of Chemistry, 5th edit. p. 377.

IV. Acrid Vegetables.—The inflammation excited by these substances requires merely soothing fomentations and emollient dressings. The smart from the sting of nettles may, it is said, be allayed by a weak infusion of tobacco, if severe enough to require any remedy at all.

If an irritating fluid have been injected into the cellular tissue, free incisions must be made, both to allow its escape and to afford exit to pus. By this means sloughing of the skin may often be avoided, although very likely to occur when the subjacent tissue is extensively disorganised.

CHAPTER VII.

EFFECTS OF THE POISON OF HEALTHY ANIMALS, AND TREATMENT OF POISONED WOUNDS GENERALLY.

SECTION I.—EFFECTS OF POISONOUS INSECTS AND SERPENTS.

I. Insects.—The bites or stings of any insects that are met with in England are not of sufficient importance to need surgical assistance, unless inflicted in extraordinary numbers, or in peculiar situations. Mr. Lawrence*, mentions the case of a French gentleman who was so severely stung by bees about the upper part of the chest, that he died in fifteen minutes, with all the symptoms of mortal collapse usually produced by the bite of venomous serpents. Children, if much stung by bees or wasps, may suffer severely from headache and fever. But the most common instance of danger from these insects is the alarming suffocation produced when their sting is inflicted in the pharynx or back part of the mouth, which sometimes happens when they are concealed in fruit, and are incautiously taken into the mouth.

Treatment.—If a person have been stung sufficiently to cause faintness or constitutional depression, cordials and opiates must be administered without delay. Respecting the *local treatment,* the first thing to be done is to examine the parts with a lens, and extract the stings with a fine forceps, if they have been left in the wound, as they very frequently are. Then the best applications are the diluted liquor ammoniæ, spirit of hartshorn, or spirit of sal-volatile; carbonate of soda or chalk; vinegar, or eau de Cologne; also, soap liniment, or compound camphor liniment, may be used to remove the œdematous swelling that remains. The author has been informed by a friend at Sydney, that a poultice of ipecacuanha is there considered to be a specific for almost every kind of venomous bite.

In the case of a *wasp or bee-sting in the fauces,* with urgent danger of suffocation, leeches may be applied externally; and gargles (especially hot salt and water) should be frequently used, in the hope of reducing the tumefaction, by causing a copious flow of blood and of saliva: but if these measures fail of affording relief, an opening must be made into the larynx or trachea.

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* Lecture, Med. Gaz. vol. v. p. 582.

For the bites of bugs, fleas, gnats, mosquitoes, &c., the treatment is the same.

II. SPIDERS.—The most celebrated of this class is the tarantula, the miraculous effects imputed to the bite of which are too well known to need repetition here; and we can feel but little hesitation in subscribing to the opinion of Ray, "that the dancing of the *Tarantati* to certain tunes and instruments, and that these fits continue to recur yearly as long as the tarantula that bit them lives and then cease, are no other than acting fictions, and tricks to get money." We learn, however, from the least romancing of the old writers, that it produced swelling, lividity, and cramps, which were cured by scarifications and wine; and these are just the symptoms it might be expected to cause, and the most rational cure. The effects of the scorpion are similar. There is one very singular case on record, of a gentleman bitten on the penis by a spider, in America, suffering from violent vomiting, deep-seated abdominal pain, and suffocative spasms in consequence. He was relieved in thirty-six hours by bleeding, opium, and ammonia.[*]

III. SERPENTS.—The venom of these animals operates, as Fontana observed, by "destroying the irritability of the nerves, and disposing the humours to speedy corruption." The symptoms produced vary in their nature and degree, according to the species of serpent, its degree of vigour, the frequency with which it may have bitten, and the strength of the sufferer. Some serpents can kill only small animals: the poison of some is very virulent, but soon exhausted by frequent biting: that of others is mild but not easily exhausted; some, again, act so energetically on the nerves, as to cause death speedily by convulsions; others produce inflammation of the lungs; and others, whose venom is insufficient to annihilate the nervous functions at once, kill more slowly by the unhealthy or diffuse inflammation which they excite at the bitten part.

VIPER.—This is the only poisonous snake in the British Isles, but it is not often that it kills human beings. The properties of its venom were most painfully investigated, in every possible point of view, by the Abbé Fontana;[†] who ascertained that it is a yellow viscous liquid, not inflammable, and neither acid nor alkaline; that it contains no salts; and that it has no taste, except perhaps a slight astringent sensation if it is kept in the mouth for some time. It is not hurtful to another viper, nor does it appear to affect certain cold-blooded animals, as leeches and frogs. Moreover, it is perfectly harmless if applied to any natural mucous or cutaneous surface; so that large quantities of it have been swallowed with impunity.

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[*] Ray, Phil. Trans. 1698, vol. xxi. p. 47; Boccone, Musco di Fisica; Hulse, Am. Journ. Med. Sc., May, 1839; Gozzo, Gaz. Med. 1845, quoted in Ranking, vol. ii.

[†] Felix Fontana, Treatise on the Venom of the Viper, translated by Joseph Skinner, 2nd edit. Lond. 1795.

COBRA DI CAPELLO.—Dr. Russell found that this was capable of killing a serpent called *Nooni Paragoodo,* but not another cobra; and that its poison was insipid when taken into the mouth, and productive of no ill consequences when applied to the eyes of chickens. The symptoms produced on animals bitten by it are fainting and convulsions, but no swelling; the lungs are stuffed with blood.* In the well-known case of the keeper at the Zoological Gardens who was bitten on the root of the nose by a cobra, on the 20th October, 1852, there was no swelling, though there was a slightly-pinkish hue of the eyelids; dyspnœa, stupor, paralysis of the extremities, and coma came on, and the patient died in 95 minutes. Artificial respiration and galvanism were the remedies employed. The chief points of interest in the post-mortem examination were a dark, alkaline, and fluid state of the blood, which emitted a peculiarly sour and sickly smell; and intense congestion of the lungs, spleen, and other internal organs.† Mr. Buckland, in dissecting an animal which had been bitten by a cobra, became infected through a scratch on the finger, and felt great prostration, which he relieved by ammonia.‡

RATTLESNAKE.—This snake, unlike most others, is capable of poisoning itself. Capt. Hall made one bite itself, and it died in eight minutes. Its effects, according to Sir E. Home, may be divided into two stages, either of which may prove fatal. During the *first*, which may last for sixty-two hours, the symptoms are those of great prostration of the nervous system, and contamination of the blood; vomiting, deadly coldness, faltering pulse, the skin livid or jaundiced, bleeding from the nose, fainting fits, convulsions, and delirium. Meanwhile the bitten part swells immensely from effusion of acrid serum, and becomes mottled with blood, extravasated under the skin; and this swelling extends to the trunk. Sometimes it is attended with excruciating pain, sometimes with mere numbness or coldness. During the *second stage*, large diffused abscesses form in the swelled parts, which contain bloody unhealthy pus and sloughs of cellular tissue, and are attended with low fever. After death the body putrefies very rapidly.§

SECTION II.—TREATMENT OF POISONED WOUNDS.

In the first place, measures must be taken to remove the poison from the wound or to destroy it.

This may be attempted by passing a ligature tightly round the limb, as near as possible to the wound, and between it and the heart, or by cutting the poisoned part clean out; then by thoroughly sucking the wound and bathing in hot water, to encourage bleeding; or by putting an exhausted cupping-glass over it; or, lastly, by cauterizing it. This may be done by liq. ammoniæ or nitric acid; or if the patient can be chloroformed, there need be no scruple in using a red-hot iron.

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* Patrick Russell, M.D., F.R.S., An Account of Indian Serpents, 2 vols. folio, Lond. 1796. Davy, Physiological Researches, Lond. 1839.

† Lancet, Oct. 30, 1852:

‡ Buckland, F., Curiosities of Natural History, Lond. 1857.

§ Sir Everard Home, Phil. Trans. vol. c. Case of T. Soper, who was bitten by a rattlesnake. Hall on the Poison of Rattlesnakes, Phil. Trans. vol. xxx. p. 309. Case of Mr. J. Briental, who was bitten by a rattlesnake, reported by himself, Phil. Trans. vol. xliv. p. 147. Case of a man bitten by a rattlesnake to cure lepra, Clarke, Lancet, Dec. 15, 1838.

The *treatment of snake-bites* consists in the administration of powerful diffusive stimulants, such as hot brandy and water, whisky, ammonia, or the *eau de luce*, which should be given abundantly, in as large quantities as the patient can swallow them. In America, what is called the *Western Cure* consists in making the patient drunk; and very large quantities are required. Vomiting of bile seems to be a favourable symptom and effort at elimination, and may be treated by more brandy and by a mustard poultice to the epigastrium. If the patient cannot swallow, spirits and ammonia may be injected into the stomach and rectum; and if the breathing flags, it must be kept up by galvanism, or artificial respiration.

Arsenic, in doses of a grain in solution every half-hour, for five or six doses, is a remedy which has proved successful;* but spirits and ammonia are less hazardous.

Parts that are swelled should be well rubbed with liniment of ammonia: if abscesses form, early incisions will be requisite.

SECTION III.—ENTOZOA.

I. The GUINEA WORM.—*Dracunculus*, or *Filaria Medinensis*, is a cylindrical thread-like worm, but sometimes as thick as a crow-quill, and several feet long. It is endemic in Africa, India, and other hot countries, whence persons often return to England with this pest about them. The worm appears, whilst exceedingly small, to penetrate the skin and effect a lodgment in the cellular tissue, where it remains dormant for some time, and gradually increases in size till it can be felt as a little tumour, or perhaps as a cord-like ridge under the skin, feeling like a varicose vein. At last a very painful boil forms, which breaks, and allows the animal's head to protrude. Often, at this time, if injured, a considerable quantity of milky fluid exudes from it, which, on examination, is found to be full of small filariæ. If the case is neglected, violent inflammation and abscesses ensue; to prevent which the animal must be carefully extracted entire. If the head does not protrude, a cut should be made across the track of the animal, which should be gently lifted up, and then a small roll of plaster be put under it, round which it should be carefully wound, day after day till it is extracted. Extreme cleanliness, and the application of assafœtida, are said to act as preventives.†

II. The CHIGOE (*Pulex Penetrans*) is a minute insect, abundant in the West Indies, which penetrates the skin of the feet, and forms a little cyst beneath it, in which it deposits its eggs. When the cyst is fully formed, it may be of the size of a pea, and is of a bluish colour. The symptoms are a violent itching. The treatment consists in extracting the bag containing the creature and its eggs, which operation is dexterously enough performed by the negroes with the point of a needle. and the cavity left is filled with tobacco ashes. If the bag is broken in the extraction, so that the young chigoes escape, violent inflammation is the result.

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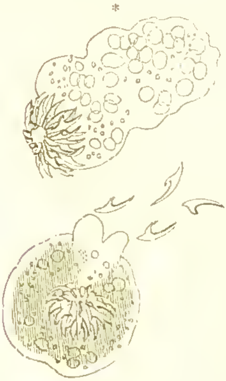
* A letter to T. Chevalier, Esq., on the effects of arsenic in counteracting the poison of serpents, Med. Chir. Trans. 1813, vol. ii. p. 396.

† See a paper by M. Maisonneuve in the Lancet for 1845, vol. i. p. 152.

III. The ECHINOCOCCUS.—This is a minute gregarious animal, inhabiting a cyst, filled with a watery fluid. which is commonly known by the term *hydatid*. "The cyst of the echinococcus," says Mr. Busk, "is contained either singly or in numbers in the interior of a cavity, lined with an organized false membrane, to which it has no kind of adhesion whatever. It is found of all sizes, from that of a pin's head, to that of many inches in diameter." When recent it is transparent and colourless; immersed in spirit, or in water, it becomes opaque; and flaccid from exosmosis in the former, distended from imbibition in the latter. The walls of the cyst are laminated, and of variable thickness; it contains a perfectly-limpid liquid. On its inner surface may be seen, scattered irregularly, a number of minute opaque granules, like grains of sand; they are covered by the innermost layer of the cyst, but are detached by the slightest force. or by incipient decomposition. Each of these granules consists of a delicate membrane, containing a mass of echinococci, all attached by short pedicles to a central stem of granular matter, which also attaches them to the inside of the hydatid cyst. Each echinococcus consists of a rounded body of tolerably solid matter, containing numerous ovoid bodies under its outer coat, and of a head surrounded with a circle of teeth or spines, precisely resembling those of the tænia and cysticerci. These teeth are perfectly characteristic, and not easily decomposed.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The echinococcus cyst is most frequently found in the liver: it may. however. occur in the bones, or in the areolar tissue; especially about the eye, and deep amongst the muscles at the root of the neck. The outward symptoms are those of an encysted tumour, which. if punctured, gives exit to a clear serous or purulent offensive fluid (for the condensed sac containing the hydatids may suppurate): and the hydatid cysts themselves, or portions of them, will shortly protrude. The diagnosis in doubtful cases will be determined by finding the teeth: of the treatment little can be said beyond free incisions if possible, and the injection of creosote and other lotions, to kill the parasites, and check putrescence.[*]

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* The uppermost has its head protruded: the lower one shows the teeth in its inside as usual while living, and the neck a little protruding. 200 diameters.

IV. The CYSTICERCUS CELLULOSÆ is an animal of the same description as the preceding, but larger, of the size of a pea. It has been found in the anterior chamber of the eye, the cellular tissue of the lids, the pia mater, tongue, the areolar tissue and muscles. It should, when detected, be removed by incision.[†]

CHAPTER VIII.

POISONS CONTAINED IN DEAD HUMAN BODIES, AND DISSECTION WOUNDS.

DURING the decomposition of animal matter, a number of complex substances are formed, which have a most deleterious effect if introduced into the blood of living animals. If inhaled, and especially if inhaled continuously, as they are in the dissecting-room, they are capable of producing sickness, dyspepsia, diarrhœa, nauseous taste in the mouth, and other symptoms indicative of the presence of deleterious miasmata in the blood. But these poisons are usually quickly eliminated, and their effects removed by fresh air, aperients, and stimulants. Sometimes also by inhalation,[‡] but more particularly, if inoculated, they produce most disastrous effects in the form of inflammation of the lymphatics (See Part III. chap. IV.), and of diffuse cellular inflammation, with pyæmia. We have already spoken of the latter maladies, generally; now we propose to describe them more particularly as they occur from dissection wounds, remarking that the bodies of persons who have died from disorders of an erysipelatous nature, or from puerperal fever, are pre-eminently contagious, and much more dangerous than bodies usually are from mere putridity.

SYMPTOMS.—Supposing the patient to have infected his finger through a wound (which is in most cases so slight as to pass unheeded), at a period varying from six to eighteen hours subsequently, he feels altogether unwell: he is depressed, faint, and chilly, and complains of lowness of spirits and nausea. These symptoms are soon succeeded by rigors, severe headache, and vomiting; the pulse is frequent and sharp, but weak; the tongue is coated, and there is the greatest restlessness and despondency. Then the *first local symptom* appears in the form of a most excruciating pain and tenderness of the shoulder, corresponding to the hand that was wounded. And in some cases there soon afterwards arises a pustule or fester, on or near the wound. But this may be unattended with any pain, and the patient may be ignorant of its existence, or may not even be aware that he has received a wound, till his attention is directed to it by his attendants. As the case proceeds, the pain in the shoulder becomes more excruciating, and is attended with fulness of the axilla and neck; and a doughy swelling appears on the side of the trunk, often extending from the axilla to the ilium. At first it is pale; but it soon assumes an erysipelatous redness, or rather a pinkish tint, like that of peach-blossoms. The breathing now becomes difficult; the pulse quicker and weaker; the tongue dry, brown, and tremulous; the mental distress is truly appalling, although there is seldom delirium; the countenance is haggard, and the skin yellow; and the patient often expires before the local disease has made further progress.

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[*] Vide Busk in Trans. of Microscop. Society, vol. ii. p. 14; Dixon, Med. Chir. Trans. vol. xxxv.

[†] See a paper by E. Canton, Lancet, 1848, vol. ii. p. 91; Gulliver, M. C. T. vol. xxiv.; Haynes Walton on the Operative Surgery of the Eye, p. 502.

[‡] Travers gives two cases. A Mrs. Clifton died of diffused cellular inflammation following a prick. Two of her attendants became ill from the contact and effluvium of the discharge, although neither had any wound through which a poison might be inoculated. One of them suffered from acute fascial inflammation of the arm; the other from low fever, and abscess in the axilla. The latter was engaged in unfolding some sheets from which a most noisome smell proceeded, when she was all at once seized with sickness and faintness, and excruciating pain in the axilla.—*Constitutional Irritation*, p. 373, 3rd ed. See also Tyrrel's edition of Sir A. Cooper's Lectures, vol. iii.; Nunneley on Erysipelas; Copland's Dict. p. 301.

VARIETIES.—1. In one small class of cases, the influence of the morbid poison is so virulent that the patient actually *dies of the precursory fever,* before sufficient time has elapsed for any local disease to appear—either in the axilla, or in the wound, or elsewhere. The most speedily fatal case on record, that of Mr. Elcock, was of this variety. He died in forty hours from the receipt of the dissection wound; and the nervous commotion and mental despondency which he suffered were even parallel to those of hydrophobia. Dr. Bell, of Plymouth, died in the same manner. 2. In another class, diffuse cellular abscesses occur in several remote parts—the knee, or elbow, for instance, as well as in the axilla, as in the case of Mr. Shekelton.*

3. In other cases the wounded finger inflames violently, and suppurates or sloughs; or the diffuse inflammation begins at the wrist, and extends up the arm, or an attack of cutaneous erysipelas accompanies the mischief in the subcutaneous tissue.

4. In a fourth class, inflammation and abscess of the lymphatic vessels and glands may be superadded.

TERMINATION AND CONSEQUENCES.—If the case do not terminate fatally at an early period, extensive and foul collections of matter form in the parts that have swelled; and abscesses continue to gather under the skin, or between the muscles of the trunk and limbs: and from these the patient may slowly sink;—or, if he survive, his existence may be a mere burden; one or more of the fingers may perish by gangrene, the arm may remain stiff and useless, or the seeds of consumption or dropsy may be left in the system.

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* The case of Dr. Bell may be found in Butler on Irritative Fever. Those of Mr. Elcock and Mr. Shekelton are quoted at length (with many others) in Travers on Constitutional Irritation. See also a paper by Mr. Adam, in the Glasgow Medical Journal, August, 1830; Stafford in Med. Chir. Trans. vol. xx. 1836.

MORBID ANATOMY.—The morbid appearances are those of the various grades of diffuse cellular inflammation. The following may be quoted as a fair description of an advanced stage.* The *cuticle* covering the affected side of the trunk, vesicated and wrinkled;—the *cutis* mottled and gangrenous in patches;—the *subcutaneous cellular tissue*, in some parts distended with serum, in others, softened and turgid with pus; the *tissue between the muscles* of the trunk, as well as that which separates the different muscular fasciculi, also softened and purulent;—the *muscular fibres*, of a dirty yellow colour, and softened;—the *axillary glands* enlarged, but not suppurating;—the axillary *artery* and *nerves* healthy;—but the *veins* (especially the smaller branches) dirty red, and softened;—the brachial and median-cephalic veins of the wounded arm, slightly red, but the fore-arm healthy; and *no connection whatever to be discovered between the abrasion on the finger and the morbid parts in the axilla;*—the *pleura* of the affected side greatly inflamed;—the lung covered with lymph, and much serum effused into the cavity of the chest.†

TREATMENT.—This is identical with that of erysipelas and pyæmia. (See p. 62.) The indications clearly are, to eliminate the poison from the blood; to support the strength; and to relieve pain and promote the discharge of pus or sloughs. First purify the blood by a dose of calomel and by enemata, bearing in mind the experiments of Gaspard and Cruveilhier, in which dogs, into whose veins putrid pus had been injected, recovered on passing black and fetid evacuations.‡ The thirst must be quenched with lemonade, soda-water, and effervescing draughts; beef-tea, and other forms of nourishment, be liberally given; wine, or brandy, or beer, be administered in sufficient quantity to support the pulse; and opium, to render the patient unconscious of his severe pain. This should be given in a full dose at bed-time, and in smaller ones during the day.

Local Treatment.—So soon as pain is first experienced in the axilla, warm poppy fomentations should be applied. But so soon as any distinct swelling can be detected, an *incision* should be made into it,—in order to relieve pain and tension, and to prevent the diffusion of serum or pus that may have been formed in the meshes of the cellular tissue. Incisions are the *sine quâ non* of the treatment; the point on which success mainly depends: and it is most truly observed by Mr. Stafford, that, in most of the cases that have hitherto occurred, if swelling or abscess formed and were not opened, the result was fatal.

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* Abridged from the case of Mr. Young, in Duncan's paper in the Edinburgh Med. Chir. Trans. vol. i. Quoted also in Travers, op. cit.

† Dr. Law, in a valuable paper in the Dub. Med. Journal, Nov. 1839, gives several cases of glanders and diffuse cellular inflammation mistaken for acute rheumatism.

‡ Quoted in Ferguson on Puerperal Fever, p. 54.

If the patient survive, he should as soon as possible be removed into the country, and be put on a course of tonics and liberal diet. All the collections of matter, which sometimes continue to form for months, should be opened as soon as they are detected; and the ulcers that remain be dressed with stimulating lotions and bandages.

PRECAUTIONARY MEASURES.—We need scarcely comment on the expediency of using some precautions in performing post-mortem examinations, especially if the operator be out of health, or if the patient have died of any disease of an erysipelatous character. Scratches on the fingers, and hangnails, should be covered with adhesive plaster or collodion, or be touched with the nitrate of silver to form an eschar, and the entire hands should be well smeared with lard. If the operator should puncture himself, or should suffer a scratch or abrasion to come in contact with the fluids of the subject, he should immediately wash his hands, and thoroughly suck the wound. Then the nitrate of silver should be applied to it, in order to decompose the poison and excite a slight inflammation, which will prevent imbibition.

CHAPTER IX.

EFFECTS OF POISONS GENERATED BY DISEASED ANIMALS.

SECTION I.—HYDROPHOBIA.

DEFINITION.—Hydrophobia is a disease caused by inoculation with the saliva of a rabid animal, and characterised by intermitting spasms of the muscles of respiration, together with a peculiar irritability of the body and disturbance of the mind.

SYMPTOMS IN THE DOG.—Since prevention is better than cure, it is very desirable that every medical practitioner should know the symptoms of rabies in the dog, and most especially the earliest symptoms. These, according to Mr. Youatt, are "unusual sullenness, fidgeting, and continual shifting of posture." The dog retreats to his basket or bed for several hours, where he lies curled up, with his face buried between his paws. Then he becomes fidgety, continually changing his resting-place; appears clouded and suspicious in his countenance, and gazes strangely about him as he lies on his bed. A peculiar delirium is also an early symptom: the dog perhaps springing up and giving an angry bark at some imaginary object. "I have again and again," says Mr. Youatt, "seen the rabid dog start up after a momentary quietude, with unmingled ferocity depicted on his countenance, and plunge with a savage howl to the end of his chain." But if his master speaks to him every fancied object of terror disappears, and he crawls towards him with his usual expression of attachment. Then comes a moment's pause,—a moment of actual vacuity,—"the eye slowly closes, the head droops, and he seems as if his fore-feet would give way and he would fall; but he springs up again, every object of terror once more surrounds him, he gazes wildly around, he snaps, he barks, and he rushes again to the end of his chain to meet his imaginary foe."

The amount of *ferocity* displayed by rabid dogs varies extremely. Some there are whose fury knows no bounds, and who, if loose, rush out, biting every man and beast in their way. Others, on the contrary, not only cannot be made to bite, but, in the very earliest stage of the disease, show an *increased fondness*, and are perpetually trying to lick their owners' hands and face. Many cases are on record of persons who have been thus infected through some accidental scratch or abrasion; and hence when rabies has been detected in a dog, it is most important to inquire whether any persons have scratches which he may have licked, and if so, these should be cauterized at once.

Another early and constant symptom of rabies is *change of voice*. Every sound uttered by a rabid dog, says Mr. Youatt, is more or less changed. But there are two sounds in particular that deserve notice; one of which is described as a "hoarse inward bark, with a slight elevation of tone;" and the other a most peculiar and characteristic combination of "a perfect bark, ending abruptly and very singularly in a howl, a fifth, sixth, or eighth higher than the commencement."

Other symptoms, observed at the commencement of the disease, are, loss of appetite, propensity to lick cold surfaces, such as stones or iron, and to devour straws, litter, and similar rubbish; and peculiar eagerness, in scenting at and licking not only the common urining places, but corners in rooms that are not usually disgraced by this evacuation. This is considered a highly-important symptom. There is no *dread of water* as in the human being; on the contrary, an insatiable thirst, which the dog endeavours to allay by lapping as long as he has power over his jaws. The mouth is dry, and the saliva exceedingly viscid; at first, perhaps, it is slightly increased in quantity, but this increase soon passes off, and the secretion becomes extremely viscid and scanty, sticking to the corners of the mouth, and annoying the poor dog extremely, who may be seen fighting with his paws at the corners of his mouth, as if trying to dislodge some bone which had stuck between his teeth.

Thus, the disease when fully formed, is characterised by delirium with more or less ferocity, alteration of the voice, great thirst, and viscidity of the saliva, to which may be added perfect insensibility to pain. As it approaches its termination, the eye becomes dull; the hind legs first, and then the muscles of the jaws are paralyzed, and at length the poor animal dies exhausted.

But there are some cases in which paralysis of the muscles of the mouth and jaws is a very early symptom; the mouth being open and the tongue protruding. A poor dog in this condition will plunge his muzzle into water up to the very eyes in order that he may get one drop into the back part of his mouth to cool his parched throat. This form of the disease is generally called *dumb madness*.

The usual *duration* of rabies is from four to six days.

The post-mortem appearances show merely the *effects* of the malady, in various degrees of congestion of the mucous membrane of the respiratory and alimentary surfaces. The *tongue*, often torn and bruised, and covered with filth; its papillæ prominent and reddened, the mucous follicles about the frænum enlarged. In the *dumb madness*, the tongue hangs from the mouth, and is swelled and dark-coloured. The fauces show a more or less partial blush, and the epiglottis and larynx are usually much injected. The trachea, bronchi, and lungs, are sometimes much congested, sometimes the reverse. The stomach generally shows vivid redness, or sometimes patches of ecchymosis on the summit of its rugæ; the brain, intestines, bladder, and heart display no appreciable or constant morbid signs whatever. Perhaps one of the most characteristic evidences of rabies that dissection affords is the presence of a peculiarly-mingled mass of hay, and hair, and straw, and earth, and excrement in the stomach, or perhaps in the fauces, where it may have lodged from defect in the power of deglutition.*

CAUSES.—The cause of this malady in dogs is most frequently a bite from another animal already diseased; yet it must occasionally arise spontaneously. And the most probable sources of its origin are close confinement, rank unwholesome food, want of the *couch grass*, the natural medicine of the dog, and deprivation of sexual intercourse.

Besides the dog, it is probable that hydrophobia arises spontaneously in the wolf, jackall, badger, and perhaps the cat. But it may be communicated to many other mammiferous animals, and there is no doubt but that every animal capable of taking the disease can also propagate it. This is equally true with regard to human beings as to animals. MM. Magendie and Breschet inoculated two healthy dogs on the 9th of June, 1813, with the saliva of a man who was labouring under the disease, and who died of it the same day at the Hôtel Dieu. One of the dogs ran away, but the other was affected with decided rabies on the 27th of July following, and died of it; and some other dogs, which it was made to bite, died also. Well-authenticated cases are recorded, in which the disease was communicated to man by pigs and horses; and there is no doubt but that it would be so much more frequently, if it were the instinct of herbivorous animals to show their rage by biting. Breschet, in the course of numerous experiments on the subject, repeatedly infected dogs with the saliva of rabid horses and asses. One curious fact demonstrated by these experiments is, that when rabbits, or other rodentia, and birds, are inoculated with the saliva of rabid animals, they very soon die, but without exhibiting any of the ordinary symptoms of hydrophobia.†

In the *horse* the disease commences with great distress and terror, and profuse sweating; he soon becomes frantic and outrageous, stamping, snorting, and kicking.‡ In the *sheep*, the symptoms are similar. An instance is recorded in which eight sheep were bitten, and became rabid: they were exceedingly furious, running and butting at every person and thing, but did not bite. They drank freely.*

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* See *The Dog*, by W. Youatt, Lond. 1845.

† Breschet sur quelques Recherches expérimentales sur la Rage. L'Expérience, Oct. 8th, 1840.

‡ Blaine's Outlines of the Veterinary Art, 2nd edit. Lond. 1816.

There are several points connected with the propagation of hydrophobia which are still involved in great uncertainty. It is not known whether the saliva is the poisonous agent, or whether some poisonous matter may be secreted by the mouth, fauces, or lungs, and mixed with it. This, however, is not a point of much consequence; but again, it is uncertain whether the whole solids and fluids of the animal are not poisonous also. In fact, there is some reason for believing that the disease may be communicated by the mother's milk.† Moreover, it appears that it may be communicated by contact of the dog's saliva with the skin, or mucous membrane, without any wound or abrasion.‡ In a case related by Dr. Watson,§ the dog's tooth merely indented the skin of the back of the hand, but made no wound. Lastly, a point of more importance and uncertainty than any is, whether the bite of an animal in health, or of one merely enraged, may not cause the disease: it is very certain, at all events, that the bite of an animal will prove fatal long before it exhibits any outward symptoms of rabies.

SYMPTOMS IN MAN.—At a variable period after a bite, or after some other mode of inoculation with the saliva of a rabid animal which period is generally from five weeks to three months, sometimes much longer, possibly even one or two years), the attention of the patient is directed to a peculiar pain of the wounded part, together with slight heat, redness, and swelling. The pain is observed to shoot in the course of the nervous trunks, and has in general a rheumatic character. Sometimes, instead of it, there is a stiffness or numbness, or partial palsy. In some cases it is unattended with redness or swelling; in others, on the contrary, the wound has thoroughly inflamed, and has broken out into suppuration afresh, although healed long before. In some instances these premonitory symptoms have not appeared at all, or have been so slight as to pass unheeded; in a few instances they have not appeared till after the accession of the genuine hydrophobic symptoms; but in general they are observed from two to five days previously to the actual symptoms of hydrophobia. Of these, the first is a vague feeling of uneasiness and anxiety. The patient finds himself generally unwell; his mind is irritable, and his countenance gloomy; he experiences a succession of chills and flushes, with transient headache; the appetite fails: there is frequently vomiting, and sometimes a well-marked accession of fever. Next, the sufferer complains of stiffness of the neck and soreness of the throat, with severe spasmodic pains at the epigastrium; the respiration also is embarrassed, and frequently interrupted by sighing. But these symptoms are in most cases attributed to cold, and their real nature is not suspected for a day or two, till, all on a sudden, on attempting to drink, the patient is seized with a fit of suffocating spasm, and manifests extreme horror at the sight of fluids.

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* Lancet, 1829-30, vol. ii. p. 511.

† Two ewes were bitten by a mad dog, and died hydrophobic. One had two lambs, the other one; all three of which were seized with the disease a week afterwards, although they had not been bitten by the dog, nor, as was supposed, by the mothers.—Steele, Med. Gaz., Oct. 25th, 1839.

‡ Hutchinson, Lancet, Dec. 8th, 1838.

§ Lectures, Med. Gaz., May 7th, 1841.

The most prominent symptoms that henceforth present themselves, are three, viz., difficulty of breathing and swallowing, extreme irritability of the body, and peculiar disorder of the mind.

(*a.*) The *difficulty of breathing and swallowing* depends on spasm of the muscles of the pharynx and larynx. Sometimes the patient can swallow neither solids nor liquids, but more frequently the disability extends to liquids only; because they require a greater exertion of those muscles, and are consequently more liable to excite spasms. It is this circumstance that causes the aversion to fluids, and the alarm at the sight of them, which so generally characterise the disease. At first the spasms are excited only by attempts to swallow fluids; then they are brought on by the sight or thought of them: or by the motions of spontaneous deglutition; but as the malady advances, they recur in frequent paroxysms—sometimes spontaneously, sometimes excited by the slightest noise or touch. When the paroxysms have become fully developed, they cause the most frightful struggles for breath. All the muscles are convulsed, the face is black and turgid, and the eyeballs protrude from their sockets. They may come on either during inspiration or expiration, but more frequently the latter; the patient struggling most violently to expel the air that is confined in his chest through the closure of the larynx. In this disease, as in tetanus, the fatal termination may ensue from suffocation in the middle of a paroxysm, although it more frequently happens during an interval, from exhaustion.

(*b.*) Next to the spasm, the astonishing *irritability of the surface of the body* is the most prominent symptom of hydrophobia. The slightest impressions on the senses affect the sufferer most intensely. A look, or a sound; the opening and shutting of the door of his apartment; the motions of his attendants; the reflection of light from a mirror; the least impression on the skin; the touch of a feather, or impulse of the gentlest current of air, are sufficient to bring on the convulsive fits, and are most earnestly deprecated by the patient.

(*c.*) The *state of mind* is in most cases one of most profound despair. Sometimes there is great restlessness and talkativeness; sometimes maniacal fury; more rarely entire composure and tranquillity throughout the disease.

PROGRESS AND TERMINATION.—When the disease is fully established, its torments are aggravated by extreme thirst; and still more by a peculiar viscid secretion from the fauces, the irritation of which brings on the convulsive fits, and causes a perpetual *hawking* and spitting, which are very constant symptoms. Not unfrequently there is vomiting of greenish matter mixed with blood. As the disease advances, the convulsions increase in frequency and violence; there is constant restlessness and tremor; the lips and cheeks become livid, and perpetually quiver; till at length one fit lasts long enough to exhaust the remaining strength, and release the patient from his misery. An entire and remarkable remission (perhaps from the use of medicine), sometimes occurs, and the patient enjoys perfect ease, or perhaps sleeps for some hours; but yet the symptoms return, after a time, with aggravated violence. Again, in some cases, there is a perfect calm before dissolution; "the patient becomes tranquil, and most of his sufferings subside or vanish; he can eat, nay, drink or converse with facility; and former objects associated with the excruciating torture of attempting to swallow liquids no longer disturb his feelings. From this calm he sinks into repose, and, suddenly waking from his sleep, expires."[*]

MORBID ANATOMY.—The morbid appearances most frequently found are, congestion of the membranes and substance of the brain and spinal cord, and effusion of serum. Sometimes blood is extravasated around the cervical portion of the cord. The lining membrane of the fauces, œsophagus, trachea, and bronchi, are most highly vascular, the papillæ at the root of the tongue large, and the lungs congested. The stomach often contains a darkish fluid, and patches of vascularity of a dark-purple colour are found in it and in the intestines. But although some one or more of these morbid appearances are detected in most cases, still there is not one of them that is present invariably. The brain, spinal cord, and fauces have been found pale, and the stomach without spots. Hydrocyanic acid has been detected in the blood after death, but this is not peculiar to hydrophobia.[†]

PATHOLOGY.—It is quite clear, therefore, that no change of structure that has yet been discovered can be considered essential to the existence of hydrophobia. It is true that the difficulty of breathing and swallowing may be partially accounted for by the inflammation about the fauces, and the great irritability of the surface is symptomatic of irritation of the spinal cord. But still no mere local changes can explain the mass of symptoms, which must depend on a peculiar change in the blood, or nervous system, or both.[‡]

DIAGNOSIS.—The chief diagnostic signs are the spitting, and especially the influence of slight currents of air in bringing on the convulsive attacks. In July 1854, the writer saw a case with his friend Dr. Challice of Bermondsey. The patient, a middle-aged woman, had been bitten in the foot by a cat in the April preceding. She was lying in bed, rational and tranquil, and nobody could have seen at the first glance that she ailed much. The writer took her hand to feel her pulse; and whilst doing so, breathed on it as gently as possible. Instantly the poor woman started up in bed choking with spasm in the throat. This was sufficient for the diagnosis.

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[*] Bardsley, Cycl. Pract. Med. *Art.* Hydrophobia.

[†] Med. Gaz., 5th September, 1840.

[‡] A case of *real* hydrophobia, supposed to have occurred without any infection, is quoted from the Trans. of the Coll. of Phys. of Philadelphia, in Prov. Med. Journ. for 1850, p. 225. But if the poison can be so readily imbibed, as we have shown, through a slight scratch, or through the unbroken skin, it is more probable that the disease in this case arose from infection, unsuspected, than that it was of spontaneous origin.

PREVENTIVE TREATMENT.—As soon as possible after the bite of a suspected animal, the whole wound should be sucked, and so soon after as may be, should be excised or cauterized, or both. Mr. Youatt recommended the *nitrate of silver;* and he certainly had a right to speak in favour of it, since he was bitten many times, and escaped, though he used no other preventive; and since he gives instances in which out of several animals bitten by the same dog, those which were cauterized by the nitrate of silver escaped all further mischief, whilst some which had the wound excised, or cauterized with a hot iron, were subsequently infected with rabies. These are certainly strong facts in favour of using the nitrate of silver; but cases have occurred in which the immediate and free application of it was useless.

The rule generally given, however, is that the bitten part should be cut out, care being taken to carry the knife wide of the bite. After this, bleeding should be encouraged by the application of a cupping-glass; or the wound should be long and diligently washed in warm water. And then (especially if the bite has been irregular, so that it is uncertain whether the excision has been complete) the raw surface may be cauterized by the nitrate, or by nitric acid; or by caustic potass. Chloroform will aid the surgeon in carrying out these disagreeable processes coolly and efficiently.

When we consider that substances introduced fairly into the blood may find their way all over the body in an inconceivably short space of time (probably in nine seconds*), it will be readily seen that excision or cauterization, although performed as soon as possible after the bite, may be of no avail. Yet they *should never be omitted, let the interval be what it may.* And one case is recorded in which it is said that the patient was saved although the parts were not cut out till the thirty-first day, and not till the symptoms had actually made their appearance. This, however, is doubtful.†

Whether the wound, after excision or caustic, should be allowed to heal, or be kept open, and made to suppurate by irritating ointments, is a disputed point. The weight of authority certainly favours the latter practice, and beyond the inconvenience it can do no harm.

As for any other preventive treatment, all that can be done is to keep the patient in as good a state of health, and in as good spirits as possible. But there is not one of the innumerable so-called specifics that is worth a moment's trial.

CURATIVE TREATMENT.—Here we are met at the outset with the doubt whether hydrophobia can be cured at all; whether, like the plague and small-pox, it will not run its course, without the possibility of checking it. Mr. Youatt says that he believes he has occasionally prevented it in the dog, and that he has occasionally seen a case of spontaneous recovery; but that he has never cured it. Dr. Elliotson believes that the premonitory symptoms may show themselves in men and the disease go no further. But although it cannot be denied that a few rare cases have recovered, or have been reported as recoveries; for instance, one after enormous bleeding; one from violent salivation;* one from the use of lead in large doses;† still, as the remedies that were supposed to be successful in these cases have been used again and again in others without benefit, the recoveries must fairly be considered accidental and spontaneous.

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* Blake, Edin. Med. and Surg. Journ., Jan. 1840.

† Thompson, Med. Chir. Trans. vol. xiii., and Lancet, Sept. 23, 1837.

Pages might be filled with an account of the remedies which have been resorted to in vain. Bleeding, which is quite inadmissible; the injection of warm water into the veins, which in Majendie's hands certainly proved a palliative; opium, which sometimes affords temporary relief; ice crunched in the mouth and swallowed, and applied in bladders to the spine; Indian hemp and chloroform: of all these it may be said, that although they may mitigate the patient's sufferings, yet, that the disease seems to have in it some source of mortality quite independent of outward or local symptoms, and not to be neutralized by any remedy yet within our reach.

In the present state of our knowledge, the principal object is to allay the patient's sufferings. This should be done by keeping him perfectly quiet, and in the dark; and by the administration of opium, chloroform, Indian hemp, and other sedatives and narcotics. The strength should be kept up with whatever nutriment can be taken, and by tonics. For further details we may refer to the Chapter on Tetanus, with which this disease has the closest analogy.

SECTION II.—THE GLANDERS.

DEFINITION.—The glanders is a disease of the horse tribe, communicable to man and other animals. It is chiefly manifested by unhealthy suppuration of the mucous membrane of the nasal cavities, pustular eruptions on the skin, and unhealthy abscesses in the lymphatic system.

SYMPTOMS IN THE HORSE.—It may occur in two forms, which, however, are merely manifestations of the same disease in different parts. When seated in the *lymphatic system*, it is called *farcy*—when in the *nasal cavities*, *glanders*. But these two forms are essentially identical; the pus of either of them will reproduce the other; and farcy always terminates in glanders, if the animal live long enough, and its progress is not arrested.

Farcy begins with hard, cord-like swellings of the lymphatic vessels and glands, called *farcy-buds*. These slowly suppurate, and form unhealthy fistulous sores, which discharge a copious thin sanious matter.

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* Account of the effects of a bite of a wild jackal in a rabid state, as the same occurred at Kattywar, in the East Indies, in 1822. Med. Chir. Trans. vol. xiii. 1825.

† Med. Gaz., April 14, 1838.

If suffered to proceed unchecked, farcy leads to glanders, although more frequently the latter arises first.

Glanders.—Its symptoms are, a *continued* flow of discharge from one or both the nostrils (generally the left), which discharge is at first thin and serous; then thick and glairy, like the white of egg; but after a time becomes opaque, purulent, bloody, and horribly offensive, retaining, however, its viscidity. Soon after it commences, an enlarged gland may be felt under the lower jaw adhering to the bone. The next things noticed are one or more ulcers on the Schneiderian membrane, having the sharp edges and scooped-out character of chancre; these spread widely and deeply, and lead to caries of the bone. Then the lips and eyelids swell, and the conjunctivæ suppurate; and the external parts of the face may become gangrenous, and the animal may die in a few days with putrid fever; or he may perish more slowly;—the disease spreading to the lungs, and death being induced by cough, emaciation, hectic, and the formation of unhealthy abscesses in the lungs and all over the body. The *distinctive symptoms*, according to Youatt, are the *continuousness* of the discharge, and the adherence of the enlarged submaxillary gland.*

SYMPTOMS IN MAN.—This disease may appear either as glanders or farcy; either of which may be acute or chronic.

(1.) The *acute glanders* begins with all the symptoms that indicate the absorption of a putrid poison. There are general feelings of indisposition, lowness of spirits, and wandering pains; followed by fever, furred tongue, great thirst, profuse perspirations at night, great pain in the head, back, and limbs, and tightness of the chest. After some days these symptoms increase: there are severe rigors and delirium, often of a phrenitic character; the perspirations become more profuse, and sour and offensive, and are attended with diarrhœa of a similar character. Then *diffused abscesses* appear in the form of red swellings about the joints, especially the knees and elbows—the patient complains of heat and soreness in the throat; the tongue becomes dry and brown, the respiration more oppressed, and the fever assumes a decidedly low malignant character. Next (perhaps a fortnight from the commencement of the illness, sooner or later in different cases) a dusky shining swelling appears on the face, especially on one side, extends over the scalp, and closes the eyes. Then the characteristic features of the disease appear;—an offensive, viscid, yellowish discharge, streaked with blood, issues from the nostrils; and a crop of large and remarkably hard pustules (compared by some to those of the small-pox, and said by others to be about the size of a pea) appears on the face. In the meanwhile the swelling and inflammation increase;—a portion of the nose or eyelids mortifies;—the discharge becomes more and more profuse and offensive;—the pustules spread, and extend over the neck and body; fresh abscesses form and suppurate; the thirst is most excruciating; and low murmuring delirium and tremors usher in death—much to be wished for.

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* Blaine, op. cit.; Youatt on the Horse.

(2.) The *chronic glanders* is characterised by a viscid and peculiarly fœtid discharge from one nostril, with pain and swelling of the nose and eyes;—and emaciation, profuse perspiration, and abscesses near the joints, from which the patient slowly sinks.

(3.) In the *acute farcy*, the patient receives the poison through a wound or abrasion, which inflames violently, together with the lymphatics leading from it. The symptoms are attended with considerable fever, and are generally soon followed by the diffused abscesses, pustular eruption, and nasal discharge, that characterise acute glanders.

(4.) In the *chronic farcy*, a wound poisoned by glanderous matter degenerates into a foul ulcer; the lymphatic vessels and glands swell and suppurate; abscesses form in different parts of the body; and if the disease is not cured, or does not destroy the patient first, it terminates in acute glanders.*

CAUSES.—In the horse this disease may, without doubt, arise spontaneously, when the animal is subjected to the usual influences that generate putrid poisons;—namely, insufficient and unwholesome food, close confinement, and ill ventilation, especially on board ship. Mr. Youatt believes that it may arise, if the animal is kept in a poor state of health, as the climax of constitutional weakness and derangement. In man, it is generally produced through inoculation of the matter into a wound; and the matter from the abscesses or nasal cavities of human beings is capable of communicating the disease both to men and animals. A man died of glanders in St. Bartholemew's Hospital, in 1840, and the nurse who attended him inoculated her hand, and died of it also in a very few days; and two kittens which were inoculated from the nurse, became affected likewise. Moreover, the blood of a glandered horse injected into the veins of a healthy one communicated the disease, although no abnormal appearance could be detected in it by the microscope.† The time at which the disease appears after inoculation varies from three days to a month.

PROGNOSIS.—This, in the acute disease, is highly unfavourable; the chronic, however, may be recovered from.

MORBID ANATOMY.—The morbid appearances are the same both in man and in the horse. Clusters of white granules, or tubercles, or, as Dr. Craigie describes it, of matter like putty or thick pus, are found in whatever tissues the disease has invaded; in the Schneiderian membrane, in the antrum and frontal sinuses, and in the vicinity of the different abscesses. The nasal cavities mostly contain a thick brown gelatinous secretion, and are studded with foul gangrenous ulcers, from which project fungous clusters of tubercular matter.

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* Case of Mr. Turner, Travers, Constitutional Irritation, p. 399; Case of Farcy ending in Acute Glanders in seven months, L'Experience, Jan. 1839.

† Reynault, quoted in Provincial Medical Journal, 18th Feb. 1843, from the Report of the French Academy for Feb. 2, 1843.

TREATMENT.—The chief points are, to open all abscesses as soon as possible; to syringe the nasal cavities with solutions of creosote, or F. 117, 127: and to support the strength and abate the thirst with wine or brandy and soda-water, beef-tea, &c. The effluvia must be counteracted by fumigations of chlorine and aromatics. In fact, in every variety and stage of this horrible disease, the strength must be kept up, and the poisonous discharges neutralized. Creosote injections, the administration of iodide of potassium with iodine, and mercurial salivation, in different cases respectively are said to have effected cures.*

CHAPTER X.

THE VENEREAL DISEASE.

SECTION I.—GENERAL HISTORY AND PATHOLOGY.

DEFINITION.—The venereal disease, using the term in its widest acceptation, consists in the effects of certain morbid poisons, generated and usually communicated by promiscuous sexual intercourse.

It includes two distinct diseases—*gonorrhœa* and *syphilis*, each of which presents two classes of symptoms—the *primary* and the *secondary;* the primary being the effects of the morbid poison on the parts to which it is actually applied; the secondary being the subsequent results of some general disorder of the constitution.

GONORRHŒA is an inflammation of the mucous membrane of the genitals, which is occasionally succeeded by papillary eruption and by various rheumatic affections, as secondary symptoms.

SYPHILIS consists, first, of ulceration of the parts to which the morbid poison is applied, and inflammation of the neighbouring lymphatics, which are the primary symptoms; and secondly, of sundry eruptions of the skin, ulcerations of the throat, inflammations of the eyes, and inflammation and caries of the bones and joints, which are the secondary symptoms.

The primary symptoms of syphilis are undoubtedly contagious, and communicable by inoculation with the matter from the ulcers. The secondary symptoms, which depend on a general contamination of the constitution, are commonly supposed, on the authority of Ricard, not to be communicable by inoculation; but they are certainly capable of transmission from a father or mother to the fœtus in utero; from a nurse to a suckling infant, or from an infant to its nurse; and it is suspected, but not proved, that they may be communicated from husband to wife.

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* Vide Elliotson's papers in the Med. Chir. Trans. vols. xiii. xviii. (*with a coloured plate*) and xix.; the Med. Gaz. vol. xix. p. 939; case communicated from father to son, Lancet for 1831-32, vol. i. p. 698; Rayer, de la morve et du farcin chez l'homme, Mém. de l'Acad. de Méd. 1837; the cases of the patient and nurse in St. Bartholomew's Hospital above quoted, in the Lond. Med. Gaz., April 18th and 25th, 1840; case of acute glanders cured by injections of creosote by Mr. Ions, Lancet, April 30th, 1839; case of acute farcy cured by iodide of potassium with iodine, Arch. Gén. de Méd., Jan. 1843; Youatt's book on the Horse, 1845; Burgess's Translation of Cazenave on Diseases of the Skin, Lond. 1842. Case treated by mercury, recovery; Mr. Carpenter of Croydon, Med. Times, Aug. 4, 1855.

There is, moreover, a third class of symptoms, which may be called *tertiary*; consisting of various eruptions, rheumatic pains, falling off of the hair, deafness, ulceration of mucous membranes, and all kinds of anomalous cachectic complaints, which are the sequelæ of syphilis when it operates on an originally bad constitution, or is aggravated by ill treatment.

The HISTORY and ORIGIN of venereal diseases are involved in the deepest uncertainty; and it is scarcely possible, in the compass of this work, to do more than show how difficult it is to arrive at satisfactory conclusions on the subject.

1st. As to their origin: it is disputed whether these, like other diseases generated by morbid poisons, are ever produced *de novo*; or whether they are produced in all cases by infection from a similar previously-existing disease.

"I believe with my friend, Mr. Guthrie," says the late eminent army-surgeon, W. Fergusson, "that wherever prostitution is foul and unclean, restricted to few women amongst crowds of men, there the infection will be generated; which afterwards spreads through society at large. The irregularities of man are at all times punished by the generation of diseases and loss of the health; and it would be difficult to believe in a superintending providence if this transgression of divine and human law should be allowed to pass unpunished."*

The author fully concurs in this opinion. Respecting gonorrhœa, there seems but little doubt that it may be induced without contagion, both in man and in animals; in stallions, for example, which are made too rapidly to cover different mares in succession. The writer does not hesitate to state his belief that almost any surface in a state of suppuration and disintegration is capable of infecting any other. Instances are well known of cutaneous eruptions, such as ecthyma and psoriasis, following the contact of diseased secretions of animals.† Contagion is probably the rule rather than the exception, with diseased surfaces. And foul promiscuous intercourse, producing suppurating and abraded surfaces, in dirty persons, whose health is out of order, will, he believes, under some circumstances generate syphilitic poison. Seventeen galley-slaves were inoculated by M. Hernandez with gonorrhœal matter. Slight ulcers were produced, which in five of the cases healed readily enough. But the remaining twelve patients were either scrofulous or scorbutic, or in an ill state of health, and seven of these suffered from eruptions and wandering pains. And it is confessed by Ricord and

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* Notes and Recollections of a Professional Life, by the late W. Fergusson, M.D., Lond. 1846.

† See Edinburgh Veterinary Review, No. 1, July, 1858. Case of Gangrenous Ecthyma of the Arm, from attending cattle in protracted labour.

Egan. that many cases of gonorrhœa, with abrasion of the vaginal mucous membrane, were followed by mild, but well-marked secondary symptoms. But this, like most other points in the history of syphilis, belongs to the domain of reasonable hypothesis, rather than of demonstrated truth.

2ndly. The history of venereal diseases is a perfect battle-field for authors: some contending that they were known from the earliest ages; others that they were unknown till the fifteenth century. Respecting gonorrhœa, it is highly probable that it is alluded to in Leviticus, chap. xiii. and xv., and that it was well known in England in the middle ages, under the term *burning* or *brenning*. It is fairly argued also that some of the ulcers on the genitals which are mentioned by the earliest writers, by Celsus,* for instance, were probably syphilitic; that ulcers arising from sexual commerce were well known in the middle ages; and that both the primary and secondary effects of syphilis were, in those days, like many other diseases, confounded with leprosy. Syphilis appears also to have been known almost from time immemorial in China.

The arguments against the antiquity of venereal diseases are partly negative and partly positive. On the negative side it is alleged, that although ulcers or pustules on the genital organs and sundry discharges were not unknown, still that neither in Celsus, nor in any other ancient writer, do we find mention that such maladies were *solely, or even frequently, the produce of sexual commerce*; or that they were peculiarly *difficult to heal*; or that they were frequently, or indeed ever, *followed by constitutional diseases.* Whilst there is positive evidence that all at once, whilst the French army, between the years 1494 and 1496, under Charles VIII., was besieging Naples, a new and terrible disease sprang up, rebellious to every known method of treatment; attacking high and low, rich and poor; sparing neither *age* nor sex: consisting of ulcers on the parts of generation in both sexes, which were speedily followed by affections of the throat and nose; by corroding ulcers over the whole body; by excruciating nocturnal pains, and frequently by death. Whereas "not one word that can be construed into any similar affection is to be met with distinctly stated in any writer before that period."

Our own supposition is, that syphilis did exist from very early ages, but that it received increased virulence in the fifteenth century in consequence of war, famine, and the intercourse of foreigners; circumstances which in all times have produced an aggravated type of the disease.

3rdly. Another disputed question is, whether syphilis was or was not imported from America? for it will be recollected that Columbus returned from his first voyage in 1493, that is, just before the alleged European outbreak of the disease.

The greatest weight of evidence is certainly opposed to this supposition; because no such disease is mentioned by the *very earliest* historians of the discovery of that continent;—neither is it mentioned by the earliest writers on America. But besides—of the earliest authors on the venereal disease, almost all refer its outbreak to the siege of Naples—but not one for the first thirty or forty years derives it from the West Indies. And it appears pretty certain that the disease prevalent in the West Indies, which might have been brought home, was not syphilis, but the *epian* or *yaws*, or *sivens*: a disease often communicated to the *very young or old*, and to persons who do not catch it by carnal conversation.

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* De Medicinâ, lib. vi. cap. 18.

4thly. Are the poisons of gonorrhœa and syphilis identical?—Our own opinion is, that the two poisons certainly are not identical: but that they are most probably elaborated under similar conditions; and that, as happens in scarlatina, both poisons may have, under different circumstances, infinite varieties of effects and infinite degrees of intensity. Hunter believed that gonorrhœa and syphilis were identical, for he produced a chancre by inoculation with gonorrhœal matter, which was followed in three months by sore throat and eruptions. But the doctrine of Ricord is, that, although the pus of a syphilitic ulcer, like any other morbid secretion, may irritate a mucous membrane and produce gonorrhœa, still that gonorrhœal matter will not produce primary syphilitic ulcers; and that gonorrhœa will not be followed by secondary syphilitic symptoms, unless there is also a chancre or syphilitic sore in the urethra; which was probably the case with the patient from whom Hunter took the gonorrhœal matter.*

SECTION II.—GONORRHŒA.

DEFINITION.—A gonorrhœa signifies a discharge from the mucous membrane of the male or female genitals; usually produced by contagion from a similar discharge.

SYMPTOMS.—These may be conveniently divided into three stages. In the *first stage*, the patient merely notices a little itching at the orifice of the urethra, with a slight serous or thin whitish discharge. If the disease is not checked at once, it passes after a few days into the *second*, or acutely inflammatory stage. The discharge becomes thick and purulent, and when the disease is at its height is greenish, or tinged with blood. The penis swells; the glans become of a peculiarly cherry colour, is intensely tender, and often excoriated. In consequence of the tumefied state of the urethra, the stream of urine is small and forked, and passed with much straining and severe pain and scalding. All the parts in the vicinity of the genitals, the groins, thighs, perinæum, and testicles, ache and feel tender; and the patient's nightly rest is disturbed by long-continued and painful erections, and by *chordee*, that is, a highly painful and crooked state of the penis during erection. This arises from a deposit of lymph in the *corpus spongiosum urethræ*, which glues together the cells, and prevents their distension, so that when the penis is turgid with blood, it is bent at one part, and horribly painful.

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* Vide Astruc on the Venereal Disease, Lond. 1754; Hunter on the Venereal; Hennen's Military Surgery; Carmichael on Syphilis; Bacot's Treatise on Syphilis: Travers on the Venereal; Titley on Diseases of the Genitals of the Male; Wallace on the Venereal (Plates); Judd's Treatise on Urethritis and Syphilis (Plates); H. J. Johnson, in Med. Chir. Review; Colles on the Venereal; Ricord, Traité des Maladies Vénériennes, Paris, 1839; Mayo on Syphilis, Lond. 1840; Mr. Lane's Lectures in the Lancet, 1841 and 1842; Acton's Treatise on Venereal Diseases, with an Atlas of Plates, Lond. 1841; Egan on Syphilis and Inoculation, Lond. 1853; Tyler Smith, Lancet, 1853, vol ii.; Henry Lee, Lectures in Prov. Med. Journ. 1854

In the *third stage*, the inflammatory symptoms and chordee abate, and a muco-purulent discharge is left, which, when obstinate and thin, is called a *gleet*.

COMPLICATIONS OF GONORRHŒA.

1. There may be severe *irritation* or actual *inflammation of the urinary organs;* sometimes of the deeper portion of the urethra, producing great pain in the perinæum, and spasm of the accelerators and other muscles during micturition, so as to interrupt the stream of urine, and cause the most exquisite agony,—or even complete retention of urine;—sometimes of the bladder, causing a very frequent desire to make water and great pain in doing so, which lasts for some time afterwards, together with a white mucous cloud in the urine; or there may be shivering, pain in the loins, albuminous or purulent urine, tenderness of the abdomen, vomiting, and other signs of severe irritation of the kidneys.

2. *Hæmorrhage* from the urethra; from rupture of the distended capillaries during violent erection. The loss of blood generally gives relief.

3. Inflammation and obstruction of the *mucous follicles* of the urethra, which may suppurate and burst either into the urethra or externally or both.

4. *Inflammation* of the *lymphatic glands* of the groin, constituting *sympathetic bubo.*

5. *Balanitis* (βάλανος, *glans*), see p. 189.

6. *Phymosis*, or *paraphymosis*, may easily arise, owing to the swelled condition of the *glans* and prepuce. When the latter is œdematous, it presents a curious semi-transparent appearance called *crystalline*. See Part IV., Chap. XXI.

7. Inflammation of either testicle. See Part IV., Chap. XXI.

8. *Gonorrhœal rheumatism;* pain, swelling, and tenderness of the joints, especially of the knees and ankles, and fever. This generally occurs towards the decline of the complaint, and attacks young people of a delicate strumous habit. The same persons are also liable to rheumatic ophthalmia, or inflammation of the fibrous structures of the eye; but this must not be confounded with the gonorrhœal inflammation of the conjunctiva, which is caused by the contact of the discharge. Bacot says, that the rheumatism is sometimes suddenly relieved by the appearance of patches of minute papulæ or pustules.

Gonorrhœa is always most severe in first cases, and in patients who are very young, or who possess irritable or scrofulous constitutions. In such cases it may be attended with extreme fever and constitutional disturbance, and may even prove dangerous to life by leading to extensive abscesses in the neighbourhood of the bladder.*

But after repeated attacks, the urethra becomes, as it were, inured to the disease, and each subsequent infection is generally (although not always) attended with fewer of the symptoms of acute inflammation. In some instances the constitutional affection is extremely anomalous, and characterised by severe and continuous rigors.

Gonorrhœa sicca.—There is one form of gonorrhœa which is occasionally met with in the male, and Mr. Acton has often met with it in the female, in which the mucous membrane is red, swollen, and tender, but free from discharge. In the male, there are severe scalding and pain in making water, with painful erections, and the lips of the urethra are red and swelled. This form of disease has the popular name of the *dry clap*.

CAUSES.—The poison of gonorrhœa is but one amongst many other causes capable of producing inflammation and purulent discharge from the male urethra, such as—1. *Local irritation* of any sort, especially immoderate and protracted sexual indulgence, and the introduction of bougies. 2. *Disorders of the constitution*, gout, rheumatism, lithic and oxalic gravel. 3. Discharges are sometimes occasioned by the *use of particular medicines*, as guaiacum and cayenne pepper.

Again, a man may contract a pretty severe discharge from a woman who is perfectly chaste, and has not been previously infected by a third party. Thus—(*a*) The *menstrual fluid* is capable of causing urethritis with violent scalding and chordee, and followed by swelled testicle; and a considerable degree of irritation may be produced by the vaginal secretions, just previous to menstruation.† (*b*) Similar consequences sometimes ensue if the female be affected with any discharge whatever.

DIAGNOSIS.—The diagnosis of the simple gonorrhœa, that is, of discharge not arising from sexual connexion, or which a man contracts from some accidental malady in a clean, chaste woman, is well summed up by Mr. Bacot in these words:—"If a discharge come on only a few hours after connexion, and if it have continued several days without inflammatory symptoms; if the patient has been liable to some discharge after any excess of venery or of wine; in all such cases the probability is that the patient labours under some other diseased condition of the urethra, and that although the intercourse of the sexes may have been the exciting cause, still there may be no imputation on the cleanliness of the female."‡

The time at which the disease usually appears after contagion is the fourth or fifth day. The later it appears the less severe it generally is; yet in some very mild cases, the discharge comes on immediately after connexion.

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* For cases, *vide* Judd, op. cit. p. 70.

† Judd, p. 24.

‡ Bacot, op. cit. p. 101.

GONORRHŒA IN THE FEMALE.—It is important to consider the precise seat of the disorder. 1. There may be *vulvitis*, inflammation of the mucous membrane of the *external parts* only, that is, of the labia, nymphæ, meatus urinarius, and parts adjoining, corresponding to *balanitis* in the male. The discharge is profuse, often fetid, the parts much swelled, perhaps aphthous or excoriated, and there is great pain in walking and in making water. The inguinal glands may enlarge, or there may be abscess in the labia. 2. The *vagina* may be affected likewise. 3. The canal of the cervix uteri may be implicated, with or without abrasion of the mucous membrane.

CAUSES.—Discharges from the female organs may be produced by many causes. 1. Thus discharges of the first sort just spoken of are by no means uncommon in girls or women of any age, and may be the result of want of cleanliness, of teething, of disordered condition of urine, or of any other form of constitutional disturbance. The surgeon should be well aware of this, as parents are apt to be very much alarmed, and to attribute such complaints to improper causes. 2. Discharge of clear viscid mucus from the vagina is not unfrequent in debilitated subjects, the parts of generation being patulous and relaxed. 3. The canal of the cervix uteri is, as Dr. Tyler Smith has shown, the seat of the true leucorrhœa; a discharge of tenacious alkaline mucus, containing abundance of round corpuscles. This is very commonly caused by mental and other circumstances affecting the health in general, and the generative organs in particular.

DIAGNOSIS.—Are there any certain means of distinguishing the discharges caused by gonorrhœa from those arising from other sources? First, as to symptoms, it may be alleged that a purulent discharge occurring suddenly, with inflammatory symptoms, and excessively obstinate, affecting the vagina as well as the external parts of generation, in a woman who is not a virgin, is most probably gonorrhœal. The non-venereal cases, so far as the author has seen, are not so obstinate, and do not involve such an extensive track. If the discharge comes solely from the external vulva, or solely from the canal of the cervix uteri, with or without excoriation or granular surface, it is probably not gonorrhœal. But, 2ndly, if it come from the vagina, the diagnosis must be chiefly a matter of inference. Discharges from the vagina are acid, and consist of abraded epithelium and pus. But no microscopic or chemical test, at present known, enables us to distinguish those arising from idiopathic causes in chaste women, from those arising from contagion.

PROPHYLACTIC TREATMENT.—A patient who has been exposed to the chances of venereal infection would do well to wash out the front part of the urethra with a syringeful of some astringent lotion; and, if any fissures or excoriations are perceived, to touch them with lunar caustic, and apply a bit of dry lint.

CURATIVE TREATMENT.—The remedies for gonorrhœa are threefold: first, antiphlogistic measures, to get rid of inflammation; secondly, certain medicines containing a volatile oil, which has a peculiar sanatory influence on the inflamed mucous membrane; and, thirdly, astringents to check the secretion of the inflamed surface.

Of the first stage.—If the patient apply during the very first stage, *before acute symptoms have come on*, the disease may almost infallibly be cut short by employing the plan recommended by Ricord. Let him inject the urethra regularly once in four hours with a solution of two grains of nitrate of silver to eight ounces of distilled water; let this be repeated twelve times, desisting, however, sooner, if the discharge is rendered thin and bloody, which is the ordinary effect of the nitrate. Then let an injection of sulphate of zinc be substituted, and be continued till the discharge ceases. At the same time the patient should take a mild aperient, and after it, three times daily, a dose of copaiba or cubebs. He should avoid exercise, fermented liquors, salt, spice, coffee, and stimulants of every kind; he should take no supper, and should continue this regimen for a week or ten days after all trace of the discharge has disappeared. The penis should be wrapped in a piece of rag dipped in water.

The manner of injecting is of no small consequence, as the efficacy of the lotion depends entirely on its application to the whole of the diseased surface; and, as Dr. Graves observes, the ordinary opinion that gonorrhœa is limited to the anterior extremity of the urethra is unfounded and mischievous. The patient should be provided with a glass syringe, with a long bulbous extremity, and having filled it, should introduce it for about an inch with his right hand. Then, having encircled the glans penis with his left forefinger and thumb, so as to compress the urethra against the syringe, and prevent any of the fluid from escaping, he should push down the piston with his right forefinger, letting the fluid pass freely into the urethra. The syringe should now be withdrawn, but the orifice should still be compressed, and the fluid be retained for two or three minutes; after which, on removing the finger and thumb, it will be thrown out by the elasticity of the urethra. It is always worth the surgeon's while to *see* that the injection is properly used.

Instead of using an injection, many patients who apply early *before* the inflammatory stage has come on, as well as patients who have had repeated attacks, may be cured by beginning the use of copaiba or cubebs in large doses at once. The cubebs should be taken in the dose of a drachm thrice daily, and the copaiba in the form of capsules.

Of the second stage.—Supposing it to be a first attack in a young irritable subject, and that it has proceeded unchecked to the acute stage, the patient should be confined to the house for a few days, if his avocations permit it. Walking, and above all, horse exercise, should be prohibited. The penis and scrotum should be supported by a suspensory bandage, and be kept constantly wet with tepid water. The glans penis, if very irritable, should be protected by a piece of lint spread with spermaceti ointment. The diet should be moderate, to the entire exclusion of fermented liquors, and the patient should drink soda water, barley water, linseed tea, gum water, and other mucilaginous fluids. The scalding will be relieved by combinations of alkalis and sedatives (F. 174), and by a hip-bath of the temperature of 80°; but the bath should not be *hot*, nor even warm, otherwise it will excite the circulation and bring on erections. The bowels should be opened with a dose of calomel at night, and some castor-oil in the morning; and it is advisable to give half a grain or a grain of calomel with gr. one-eighth of tartar-emetic, and gr. x. of Dover's powder; or F. 63, &c., every night whilst there is much pain and chordee. The mercury is not necessary as a specific, but it is highly useful to check the inflammatory symptoms. As soon as the patient is free from fever, he should take copaiba or cubebs. Young, irritable people, however, with light complexions, can seldom take these medicines without suffering from sickness or diarrhœa, or sometimes even from fever and a rash; and every combination of aromatic and opiate that can be devised will not enable the stomach to tolerate them.

If the patient is very plethoric, and suffers greatly from pain and fever, and has a hard pulse and white tongue—and if there be great aching in the bladder or perinæum, protracted agony after micturition, tenderness in the abdomen, pain in the back, or other signs of irritation of the urinary organs—it may be right to apply leeches to the perinæum, and to administer opium freely.

It is decidedly not safe to use injections with young, delicate, irritable subjects during the acute stage, and most especially whilst there is any tenderness of the glands of the groin, or any aching in the spermatic cord or testicles; as they might easily produce swelled testicle, or great irritation of the neck of the bladder. And, as a general rule, it is best to refrain from them altogether, till the inflammatory symptoms are mitigated by the antiphlogistic remedies before mentioned.

Treatment of Complications.—Painful erections and chordee may be relieved by bathing the parts with tepid or cold water, and a combination of narcotics with antiphlogistics, F. 30, 63, &c.; and if the chordee lasts long, a little mercurial ointment and extract of belladonna should be smeared on the part at bed-time. Hæmorrhage may be checked by cold and pressure on the urethra. Inflammation of the mucous glands of the urethra is to be treated by poultices. The swelling may be punctured if it obstructs the flow of urine, but not otherwise. Swelling of the glands in the groin may generally be removed by rest, and, if necessary, a few leeches.

Of the third stage.—As soon as the acute stage has subsided, the patient should use the injections of nitrate of silver, followed by zinc, in the same manner as was recommended for the first stage. If the discharge does not cease entirely, or if it comes back again, other injections, F. 135—139, may be tried; adapting their strength to the irritability of the part, and not permitting them to cause severe pain.

But a gleet is often a very tedious complaint, and requires a judicious and long-continued course of remedies that act on the urinary organs.

together with most temperate habits of living. Copaiba, either alone or combined with astringents, F. 176; steel, F. 13, 180; and cantharides, especially in combination with zinc, F. 179, are the most useful remedies. The bowels should be kept properly open, but saline purgatives should be avoided. If the patient wants to make water oftener than natural, and there is an uneasy sensation in the urethra afterwards, and the urine deposits a mucous cloud, buchu and uva ursi (F. 181) will be advisable. It is also useful to inject the urethra with cold water from an elastic bottle twice a day. If the urine is preternaturally acid, or loaded with the phosphates, or the digestive organs deranged, the case should be treated as directed in the section on urinary deposits. If the health is materially enfeebled by debauchery or malpractices, affusion of cold water on the genitals, cold sea-bathing, blisters to the perinæum, bark and steel, good living, and perfect chastity of body and mind are the necessary remedies. If other means fail, a smooth metallic bougie may be introduced every other day, or the *porte caustique* of Lallemand may be introduced, for the purpose of slightly touching the whole of the canal with the nitrate of silver.

Gonorrhœal rheumatism must be treated on the same principles as common rheumatism. The bowels should be well cleared by calomel, and then ammonia with lemon-juice, F. 58, every four or five hours, and a dose of Dover's powder at bed-time. In the chronic stage, F. 63 or 72 at bed-time; iodide of potassium, sarsaparilla, bark, volatile tincture of guaiacum, sea air, tonics, and warm bathing, are the remedies.

TREATMENT OF GONORRHŒA IN THE FEMALE.—During the acute stage, rest in the recumbent posture, fomentations of decoction of poppy-heads and camomile flowers, frequent ablution, lubrication with lard or cold cream, and very frequent sponging with a weak solution of alum, a piece of lint dipped in which should be inserted between the labia, with laxatives and diaphoretics, are the measures to be adopted until heat, pain, and tenderness subside; afterwards injections of nitrate of silver and sulphate or acetate of zinc should be used, just as has been recommended for the other sex, and they should be continued for some time after all discharge has ceased. *Terebinthinate medicines* (copaiba, &c.) may be given, although they do not do much good unless the discharge proceeds from the urethra or its vicinity. It is supposed that these medicines produce their good effects by being excreted with the urine, and so coming in contact with the diseased surface. Hence it has been proposed to use injections of copaiba, and it is said that they do good in both sexes. Abscesses or other complications, if they occur, must be treated on general principles. In any obstinate discharge, the cervix uteri should be examined through the speculum, and the interior of its canal be touched with solid nitrate of silver, if a copious muco-purulent discharge be seen to issue from it. Steel is usually of service in chronic cases.

SECTION III.—PRIMARY SYPHILITIC ULCERS.

General Description.—Primary syphilitic ulcers or chancres may be caused by the application of the syphilitic virus to any surface, mucous or cutaneous, entire, wounded, or ulcerated. Their most frequent *seat* is the genitals; and in men they are more frequently than otherwise found on the inner surface of the prepuce, or the furrow between the prepuce and corona glandis, or the angle by the frænum; parts which should always be carefully searched for such ulcers. The *time* at which venereal sores appear is usually said to be from the third to the tenth day after infection; but it is more probable, as Ricord observes, that the syphilitic virus operates progressively from the first moment of its application, and that although no ulcer may be formed, yet that a portion of skin may have imbibed the poison, which may have produced its characteristic adhesive effect; or it may have found its way into a follicle; so that the virus is in full operation, although no actual ulcer may be perceived till later. The average duration of a syphilitic ulcer produced by inoculation is, according to Wallace, twenty-five days.

Primary syphilitic ulcers present many varieties, which may be arranged under the following heads, according to the very practical suggestions of Mr. Henry Lee—1st, the Hunterian, or indurated chancre, a slow, torpid ulcer, encircled by the adhesive inflammation; 2nd, the non-indurated, or pustulous ulcer, marked by early and free suppuration; 3rd, the phagedænic or ulcerative; 4th, the sloughing.

1. *The Hunterian or Indurated Chancre*, is generally found on the common integument or on the glans penis. It may begin either as a pimple or as a patch of excoriation which heals up, leaving the centre ulcerous.

Let us suppose this ulcer to have been produced by inoculation with the point of a lancet: during the first twenty-four hours the puncture reddens; in the second and third days it swells slightly, and becomes a pimple, surrounded by a red areola; from the third to the fourth day, the cuticle is raised by a turbid fluid into a vesicle, which displays a black spot on its summit, consisting of the dried blood of the puncture; from the fourth to the fifth day, the morbid secretion increases and becomes purulent, and the vesicle becomes a pustule with a depressed summit. At this period the areola, which had increased, begins to fade, but the subjacent tissues become infiltrated and hardened with lymph. After the sixth day, if the cuticle and the dried pus which adheres to it be removed, there is found an ulcer, resting on a hardened base; its depth equal to the whole thickness of the true skin, its edges seeming as if cleanly cut out with a punch—its surface covered with a grayish pultaceous matter, and its margin hard, elevated, and of a reddish-brown or violet colour.* The ulcer feels to the finger like a little cup of cartilage set in the flesh.

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* Ricord, op. cit. p. 89.

2. *The Non-indurated, or Suppurating*, may be said to have four stages. In the 1st, it is a small itching *pimple*, or *pustule*, which bursting displays—2ndly, a foul *yellowish* or *tawny sore*, attended with slight redness and swelling, and spreading circularly. It may or may not be covered at first with a dirty brown scab. In the 3rd stage it throws out indolent fungous granulations (and in this stage is sometimes called the *raised ulcer* of the prepuce), and is usually stationary for a little time after it has ceased to ulcerate, and before it begins to heal. In the 4th stage, it *slowly heals*; cicatrization being preceded by a narrow vascular line. If the ulcer be seated near the frænum, it is almost sure to perforate it.

3. *Phagedænic chancres* are extremely rapid in their progress, and highly painful; their surface yellow and dotted with red streaks; their shape irregular; their edges ragged or undermined; and the discharge profuse, thin, and sanious. The surrounding margin of skin usually looks puffy and œdematous, showing a low grade of vitality; but sometimes it is firm and of a vivid red. Sometimes these ulcers eat deeply into the substance of the penis; sometimes they undermine the skin extensively; but in general they spread widely but not deeply. Sores of this last description are called *serpiginous*. In many cases the sore deserves to be called irritable, rather than phagedænic; being acutely painful, discharging thin ichor; with a raised surface of yellowish exudation; but not spreading much, though it obstinately refuses to heal.

4. *Sloughing phagedæna* affecting chancres requires no observations on its symptoms distinct from those made at page 72 *et seq.* It must be added that chancres may be affected with *simple acute inflammation* leading to gangrene, from local irritation, such as horse exercise, and excess in stimulating liquors.

When the British army was in Portugal, the men suffered severely from sloughing chancre, to which they gave the emphatic name of *Black Lion*; but the disease, though so destructive to our men, was mild amongst the natives, possibly because they had become thoroughly *syphilized*, or inured to infection.*

CHANCRE IN THE URETHRA.—Ricord has proved satisfactorily that this is the cause of the secondary syphilitic symptoms which were formerly attributed to gonorrhœa. The existence of chancre in the urethra may be suspected, if in a case of gonorrhœa the discharge is very capricious, sometimes thin, scanty, and bloody, sometimes thick and profuse; and if there is one painful indurated spot. But it can only be proved, either by the ulcer being visible at the orifice, or by inoculation with the matter.

SYPHILITIC ULCERS IN THE FEMALE require no distinct observations. They do not usually cause so much distress as in the male, but they are very slow in healing, especially if interfered with by the urine. When situated high in the vagina, they may cause no symptoms at all, except, perhaps, a mucous discharge, and can be detected only by the speculum.

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* For an account of this interesting point in the history of syphilis, see the late Inspector-general Fergusson, Med. Chir. Trans. vol. iv., and Guthrie, *ib.* vol. viii.

CONSTITUTIONAL EFFECTS.—When a patient has a syphilitic sore, which has not been destroyed within five days, he is liable afterwards to those maladies which will presently be described under the term *Secondary Syphilis.* Yet it seems almost certain, that it is only after the *Hunterian variety* that such symptoms are to be dreaded, or preventive treatment required; and that sores of the suppurative, ulcerative, and sloughing varieties, and those attended with suppurating bubo, do not as a general rule inflict this penalty.

It seems, also, that the existence of a developed Hunterian chancre, or of its cicatrix if hard and red, like the existence of the vaccine vesicle, affects the entire constitution; so that if it be cut out or destroyed, the wound will assume the same character, and require the same constitutional treatment, as if the malady had not been interfered with.

It seems, also, that repeated syphilitic infection begets a kind of protection against fresh attacks; and likewise that the production of additional suppurating syphilitic sores, not only does not confer any fresh liability to secondary symptoms, but seems to diminish that which exists already. Hence it has been proposed to inoculate patients with syphilitic matter,—or *to syphilize* them, as it is termed—as a measure of prevention and cure, just as vaccination is used against the small pox. But the facts that have been published by the advocates of this disgusting proposition, are not sufficient to warrant the author in doing otherwise than most strongly deprecating it as a remedial measure, although inoculation may be occasionally justifiable as an experiment.*

SECTION IV.—AFFECTIONS THAT MAY BE MISTAKEN FOR CHANCRE.

The ordinary means of distinguishing a syphilitic ulcer are, that it is seated on the genitals; that it has followed a suspicious connexion; that it is probably circular; perhaps that it has a hardened base and elevated edges; and above all, that, if treated with simple applications merely, it is extremely difficult to heal. There is, besides, the test of *inoculation*, as proposed by Ricord. If some of the secretion of a real chancre, taken *whilst it is extending and before it begins to heal*, be inoculated into the skin of the thigh, it will most likely produce a sore of its own kind there, after the manner we have described when speaking of the Hunterian chancre. It may be right to adopt this practice in some few cases when the existence of chancre in the urethra is suspected: or when the characters of a sore on the penis are undecided; or when there is a sore suspected to be syphilitic on the face, or any other unusual part; or when it is wished to test the pus from a bubo; but the sore produced by inoculation must be destroyed by nitric acid, as soon as its character is decided, else it may give both surgeon and patient a great deal of trouble. Moreover, it must be recollected that although the production of a chancre by inoculation proves that the sore from which the matter was taken was a chancre, yet, that the contrary is by no means proved by the failure of inoculation. For a sore, though chancrous in its origin, will not yield an inoculable matter when it has arrived at its healing stage; and it is often very difficult to procure a sore by inoculation from a chancre. See p. 202.

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* See Henry Lee's Pathological Obs., Lectures on Syphilis, &c., Lond. 1854. Victor de Meric's papers in Lancet, 1853-54.

AFFECTIONS THAT MAY BE MISTAKEN FOR CHANCRE.—This is the most convenient place for describing the nature and treatment of various affections that may be mistaken for chancre.

1. *Gonorrhœa externa*, or *balanitis*, is an inflammation of the surface of the glans and inside of the prepuce, with profuse purulent discharge, and excoriation of the cuticle. It generally affects dirty people with long prepuce, and is caused either by the acrid secretions of the part, or by contact with unhealthy secretions in the female. Sometimes, however, it occurs to cleanly people whose health is disordered. The thick profuse discharge, the peculiar smell, the superficiality of the excoriations, and their appearance immediately after connexion, distinguish this complaint from chancre; and a little opening medicine, common soap and water, and any mild astringent lotion will suffice to cure it. Lime-water is the best lotion if there is much inflammation, and a grain of corrosive sublimate to an ounce and a half of lime-water if there is not. If the cure is not effected in two or three days, the excoriations should be touched with nitrate of silver. Sometimes balanitis is attended with very great inflammation and fever, and with *phymosis*, from the great swelling of the prepuce; and the pain may be so severe and gnawing, as to make the surgeon uncertain whether there is not a phagedænic ulcer concealed by the foreskin. The thick discharge, and the pain being general and not confined to one spot, form the chief means of diagnosis; and repeated injection of warm water and astringent lotions under the foreskin are the remedies.

2. *Minute aphthous-looking points*, sometimes in clusters, sometimes surrounding the glans; some of them healing, whilst others break out. They are totally devoid of pain; and although they may last a long time, do not lead to ulcers. They are best treated by black wash or mere lime-water, or lotions of *arg. nit.* or *cupr. sulph.* and alteratives and aperients.

3. *Herpes præputialis* * begins with extreme itching and sense of heat. The patient examining the part, finds one or two red patches, about the size of a split pea. On each patch are clustered *five or six minute vesicles*, which, being extremely transparent, appear of the same red colour as the patch on which they are situated. In twenty-four or thirty hours the vesicles become larger, milky, and opaque; and on the third day they are confluent and almost pustular. If the eruption is seated on the inner surface of the prepuce, the vesicles commonly break on the fourth or fifth day, and form a slight ulcer with a white

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* Bateman on Cutaneous Diseases, 5th ed. p. 238; Burgess's Cazenave, p. 88.

base and rather elevated edges. If this ulcer be irritated by caustic or otherwise, its base may become as hard as that of a chancre. If left to itself, it mostly heals in a fortnight; sooner, if situated on the external skin. The *cause* of this complaint is either some derangement of the digestive organs, or irritation within the urethra, produced by unhealthy urine. It is very liable to recur in the same individual, which, of course, if known, will greatly aid the diagnosis.

Treatment.—A little dry lint, or goldbeater's skin, at first, and subsequently a very weak lotion, with aperient and alterative medicines.

4. *Psoriasis præputii*, painful, irritable, and bleeding cracks or fissures around the edge of the prepuce; best treated by ung. hydr. nitr. dil., and arenic internally.

SECTION V.—TREATMENT OF PRIMARY SYPHILIS.

The indications for the treatment of primary syphilis, are—1st, to destroy the poisonous ulcer, and heal the breach of surface as soon as possible. 2nd, to prevent the occurrence of secondary symptoms.

Treatment.—If a patient applies so soon as he perceives the chancre, it will be advisable to destroy it by nitric acid, then give an aperient, enjoin rest and low diet, and wrap the penis in rag dipped in warm water. Even if the sore has lasted more than a week it may still be expedient to destroy it; but this will not give the same security against secondary symptoms, as in the former case.

But if the chancre presents a well-marked indurated base, or if the penis is swelled and inflamed, or the patient feverish, or if there is any swelling or tenderness in the groin, this cannot be done. When this is the case, the local applications should consist of some mild liquid capable of chemically decomposing the poisonous secretions of the sore, such as black wash, F. 125. If there is very much irritation, the penis should be enveloped in a poultice of boiled camomile flowers, and the patient be kept in bed. If there is much induration, Ricord recommends an ointment of calomel. Afterwards, during the indolent and granulating stages, the sore may be treated with any astringent lotion, and be touched occasionally with nitrate of silver or sulphate of copper.

In former days, mercury administered to salivation was deemed the specific for syphilis; and it was believed not only that it had peculiar virtues in counteracting the syphilitic poison, but also that without it every case of syphilis would infallibly go on from bad to worse. The modern doctrine, however, is, that every case of syphilis *may* be treated without mercury; that the too profuse administration of it may render the disease infinitely worse; that there are many cases which do not admit of it at all; but that in the right cases the moderate and judicious use of mercury removes the existing symptoms, and renders the patient far less liable to a relapse.

The cases in which mercury is not required or not admissible are these:—when the primary sore has been destroyed or healed within the first week; when a chancre is inflamed, irritable, phagedænic, or sloughing;

when there is a bubo, suppurating, or about to suppurate; when the patient is feverish; when he has been already broken down by repeated attacks of syphilis and by mercury; when he is known to be very easily salivated; or when mercury readily produces sore throat, loss of flesh, night-sweats, or the *erethismus* to be presently described. If the patient is scrofulous or consumptive, the surgeon must use his judgment; but neither syphilis nor mercury seem, according to Dr. Cotton, to be special causes of phthisis; and we need not abstain from the moderate use of that remedy when the consumptive tendency is but slight.

If, then, there are none of these contraindications, and if the sore be indurated, the surgeon should give mercury; not because absolutely necessary to a cure, but because it has been proved by experience to hasten the cure of the primary, and to lessen the chance of secondary symptoms.

Then the object is to induce a *gentle* mercurial action, and to maintain it *long enough*. And there are three modes of effecting this: fumigation, friction, and internal administration.

Fumigation has been employed for a very long time as a mode of applying mercurial vapour to a diseased part, and of causing it to be absorbed by the skin, so as to impregnate the whole system. For the most part, however, it was a difficult and very uncertain operation, till Mr. Langston Parker* revived and improved it by combining the vapour of water with that of mercury; but the greatest improvement is that effected by Mr. Henry Lee, who has adopted calomel as the preparation to be employed, instead of the sulphuret or oxide which had been used previously, and which required to be used in very much larger quantity, and could not be depended on from their liability to undergo decomposition. Instead of one or more drachms of oxide or sulphuret, Mr. Lee prescribes ten grains of calomel for each fumigation. Of course rather more or rather less may be used at discretion. If the patient can afford it, he may buy at an instrument-maker's an apparatus consisting of a lamp so arranged as to evaporate both the calomel and some water, with an india-rubber cloak to confine the vapour. A poor man must content himself with a heated brick or tile, which may be put into a chamber-pot under a cane-bottomed chair, on which he will sit *in puris naturalibus*, having a blanket round his neck, enveloping the chair and himself, and retaining the vapours. The heat of the lamp or brick should be such as to evaporate the dose of calomel evenly during the ten or fifteen minutes which should be spent in the operation; not to dissipate it too soon.

The fumigation should be repeated every night at bed-time, till *very slight* sponginess of the gums is produced, which should be maintained by regulating the quantity of calomel, till (if the case goes on well) the sore has healed, and hardness of cicatrix has nearly vanished. Generally speaking, however, three or four weeks is long enough. See *erethismus*, p. 193. If the internal administration is preferred, five grains of blue pill should be given every night and morning, and if no effect on the mouth is produced by the sixth day, the dose at night should be doubled.

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* H. Lee, Med. Chir. Trans. vol. xxxix.; Langston Parker, Modern Treatment of Syphilitic Disease, Lond. 1854.

The *strong mercurial ointment* is not so likely to disorder the bowels as the blue pill, but it is more troublesome, and is now almost an obsolete remedy. The dose is from ʒss—ʒj; to be rubbed in daily upon the inside of the thighs or arms till it disappears. The morning is the best time for doing it, as the skin is then softer. It should be rubbed on different limbs successively, the patient wearing the same drawers both by night and day. If the skin becomes irritated, it should be well washed and bathed. If the patient is too weak to rub in the ointment himself, it must be performed by a servant whose hands should be protected by a pig's bladder, well softened in oil and tied round his wrist.

Meanwhile the patient should live regularly, but not too low. He should avoid all excess of food or wine, and everything likely to disorder the bowels; his clothing should be warm, so as to keep the skin perspirable; and, above all, he should most sedulously avoid fatigue, cold, wet, and night air.

THE ILL EFFECTS OF MERCURY depend, first, on its tendency to localize itself, or to seek peculiar outlets for elimination; and, secondly, on its tendency to destroy or impoverish the blood constituents.

To the former category belong: 1. *Irritation of the bowels*, with dysenteric symptoms, straining and tenesmus. To be treated by opium with chalk mixture; hip-bath, and opiate enema, F. 101; omitting the mercury for a few days, and combining it afterwards with opium; and using double precaution against cold and damp.

2. *Sore throat.*—Redness of the whole fauces, and ulceration of the tonsils with fever. In this case the mercury must be discontinued for the present.

3. *Violent salivation.*—This may be caused by a too liberal use of the remedy, or by a sudden check to the cutaneous secretion by cold and damp, or by loss of blood, or anything that suddenly lowers the system. It is, however, very common to meet with persons who are salivated by very small quantities; and every practitioner should make a point of ascertaining this before he prescribes mercury for any new patient. There is good reason for believing that a great susceptibility of salivation and tendency to Bright's disease of the kidney often go together. The *symptoms* of severe salivation are, swelling and inflammation of the salivary glands, cheeks, tongue, and fauces, with a flow of peculiarly fetid saliva, and superficial sloughing of the surface of the gums and of the inside of the cheeks. The best *local applications* for this state are, gargles of brandy and water, of the solution of chloride of lime, of tannin, or of hydrochloric acid (F. 107, *et seq.*). The bowels should be kept open by aperients; and, as soon as fever has abated, the patient should have a good diet, and the iodide of potassium with

bark may be given. The experiments of M. Melsens, showing the fact that mercury and other metallic substances may long continue in the body in combination with the tissues, and that they may be dissolved out and eliminated through the kidneys by means of the iodide of potassium, furnish a good explanation of the *modus operandi* of this medicine, in all cases in which mercury has been administered to excess.* Change of air, and especially removal from the venereal wards of an hospital, are indispensable.†

4. *Eczema mercuriale* (*Eczema rubrum, Erythema mercuriale, hydrargyria*) consists of patches of redness and inflammation, which appear first on the groins, axillæ, and flexures of the limbs, and then spread over the trunk. These patches are covered with minute vesicles, which soon burst, discharging a thin acrimonious fluid, and leaving the surface excoriated, and exceedingly painful and tender. The discharge often becomes profuse and fetid, and the affected parts much swollen and fissured. It generally lasts for ten days, but may remain for many weeks.‡—*Treatment.* Warm bathing; fomentations of decoction of poppies, camomiles, or bran; aperients, diaphoretics, and opiates, during the early stages; subsequently, bark or sarsaparilla, and the mineral acids. Dr. Colles has described another and less severe form of eruption, which resembles the itch, except that the intervals between the fingers are free from it. The treatment is the same.

5. *Erethismus mercurialis* consists in an impoverished state of blood, and want of nourishment of the heart and brain. The symptoms are great depression; anxiety about the præcordia, dyspnœa, frequent sighing, weak and tumultuous action of the heart;—frequent sense of suffocation, disturbed sleep, and faintness upon any exertion, which faintness may prove fatal. In a case which the writer lately treated, calomel fumigation had been continued for eleven weeks, in order to get rid of an indurated cicatrix, and to prevent secondary symptoms; spite of which, the cicatrix continued indurated, and psoriasis had appeared when the writer saw the patient, a fortnight after the discontinuance of the mercury. The symptoms were anæmia, intense debility, sleeplessness, night sweats, copious urine, great nervousness, palpitations on the slightest exertion, and entire impotence. This case was treated as below, and is mentioned to show that the calomel fumigation is capable of doing as much mischief as mercury in any other form, and that it is unwise to push mercury as a *preventive* of future symptoms. If used judiciously it will relieve such manifestations of syphilis as exist, but cannot be always expected to eradicate the diathesis at once.

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* See Dr. W. Budd's Translation of the Essay of M. Melsens, in the Brit. and For. Med. Chir. Rev., Jan. 1853.

† Dr Macleod relates two cases of coma following the sudden cessation of salivation; one fatal; the other cured by reproducing it. Lond. Med. and Phys. Jour., vol. lvi. p. 231.

‡ One variety, *hydrargyria maligna*, now almost unknown, is attended with typhoid-like fever. Eight out of fourteen cases died. Alley on Hydrargyria, Lond. 1810.

Treatment.—Removal to a fresh atmosphere; stimulants; tonics; and nourishment; especially decoction of bark with nitric acid; followed by small doses of iodide of potassium.*

The *non-mercurial* treatment of primary syphilis consists simply in observing the rules calculated to produce the highest state of health; in treating symptoms; in relieving debility by bark, cod-liver oil, and other tonics; and pain and irritability by opium; and in administering, if the surgeon thinks fit, the iodide of potassium, with compound decoction of sarsaparilla, which latter remedy is believed not only to restore the flesh and strength, but also to assist in eliminating the syphilitic poison.

The *gangrenous chancre*, from excessive inflammation (when occurring in healthy subjects, with firm pulse), requires to be treated by rest, fomentations, purgatives, and opiates; in some cases by venesection. The poppy fomentation is the best application at first, and the balsam of Peru, or nitric-acid lotion subsequently, to assist in throwing off the sloughs. The ulcer which remains is usually healthy, and is very seldom followed by secondary symptoms; therefore *there is no need of mercury unless the sore begin to ulcerate* (there being nothing in the general health to account for it), or unless secondary symptoms appear.

But it far more frequently happens that sloughing and phagedæna are the results of broken-down health, from intemperance, or some other source of exhaustion. For such cases the treatment has been before described. Opium largely; beef-tea, wine, good living, and tonics; opiate lotion to the sore. In some cases the local application of the mercurial vapour will check an obstinate phagedæna, or serpiguous tendency. Vide p. 72 *et seq.*

If *phymosis* is present, and there is a discharge from under the constricted prepuce, the case may either be one of mere *balanitis*, or there may be a chancre under the prepuce. If there be an ulcer, it may be detected by local hardness and tenderness. Whilst there is any inflammation, fomentations and water-dressing must be applied, and a mild astringent lotion, F. 117, should be injected frequently between the prepuce and the glans. The prepuce should be slit up, if the tumefaction is so great that it threatens to slough; but not otherwise. If phymosis be caused by *small ulcers at the edge of the prepuce* (which sometimes occur during the healing of venereal sores), they should be touched with *arg. nit.* or *cupri sulph.*, or *ung. hydr. nitrat.*

As soon as the *frænum has been perforated* by an ulcer, it should be completely divided with scissors.

Chancre in the urethra must be treated by astringent injections; and by mercury, if not contraindicated by any of the circumstances above mentioned.

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* Vide Dr. Bateman's case, Med. Chir. Trans. vol. ix.; Colles' Lectures on Surgery, vol. ii. 242.

SECTION VI.—BUBO.

DEFINITION.—Bubo signifies an inflamed lymphatic vessel or gland in the groin, leading from a venereal ulcer.

CAUSES.—It must be borne in mind—1. That any source of irritation, such as gonorrhœa, or even protracted venereal indulgence, will in certain constitutions cause swelling and suppuration of the glands of the groin, without the presence or slightest suspicion of chancre. 2. A bubo accompanying a true venereal ulcer may be created, not by the ulcer alone, but by some added source of irritation, as caustic unluckily applied to an ulcer. 3. Bubo may be caused by the transmission along the lymphatics of the specifically poisonous secretions of a chancre; and here, Mr. Lee observes, that for the most part a bubo arising from a Hunterian chancre will not suppurate, and that one arising from a suppurating chancre will; that in the former case there is an almost certainty, in the latter great improbability of secondary symptoms.

VARIETIES.—1. *Bubo of the Penis* consists of an inflamed lymphatic vessel on the penis, which may be felt like a quill under the skin, and may create abscess in any part of its course. 2. *Acute bubo* at the groin generally affects only one gland, and pursues the course of an ordinary acute abscess. The cellular tissue between the gland and the skin is the common seat of suppuration, but there may also be a small abscess in the centre of the gland, arising, no doubt, from the absorption and transmission of poisonous matter, and the pus of this latter is alone capable of producing a chancre by inoculation. 3. The bubo which accompanies the Hunterian chancre consists generally of one gland, enlarged, inflamed, and adherent, but gradually dispersing without suppuration. 4. Bubo of any kind in persons weak or scrofulous, or especially if worn out by the improper administration of mercury, will lead to slow and destructive suppuration. The skin is long before it inflames, but when it does so, a large track of it becomes of a dusky-bluish tint; the matter spreads widely; and at last large portions of the skin perish by ulceration, leaving an extensive sore that may be months in healing.

DIAGNOSIS.—If a bubo at the groin affect one gland only, and that above Poupart's ligament, it is most probably caused by chancre on the penis, provided there be, or have been, one. But if many glands are swelled, and they are below the level of Poupart's ligament, the swelling is probably caused by some irritation about the foot. But the only sure diagnosis of a syphilitic bubo is, that if the matter taken from it be inoculated, it will produce a chancre;—or that the sore produced by opening the bubo presents the elevated edges and copper-coloured margin of a chancre. As, however, every bubo is attended with suppuration of the surrounding cellular tissue, the surgeon should recollect that some of the matter taken when it is first opened may not cause chancre by inoculation.

It has been disputed whether the syphilitic virus may be taken up by the lymphatics and produce a bubo in the groin, without having first caused a chancre. Such supposed cases are called *bubon d'emblée* by the French. But though it is very certain that the inguinal glands are apt to inflame and suppurate, if a person of bad constitution indulges in immoderate sexual intercourse (especially if at the same time his health is lowered by fatigue, or irregular living), still there is little proof that such buboes are syphilitic, unless preceded by chancre. Yet it must be borne in mind that they may be produced by a chancre or patch of induration so small as to have escaped the patient's notice.

TREATMENT.—1. The *acute* bubo must be treated as an acute abscess. The first indication is to produce resolution;—by rest, aperient and saline remedies, low diet, leeches, and fomentations. The applications to the chancres must be soothing, and mercury, if being administered, should be at once given up. As soon as the tenderness is relieved, pressure by means of a compress and bandage, or by placing a weight on the part as the patient lies in bed, is useful. Even if matter does form and does not seem inclined to come to the surface, the iodine paint, cold lotions, aperients, tonics and pressure, will sometimes cause it to be absorbed. But if it increases, and the skin becomes inflamed and shining, a puncture should be made, and the case be treated as any other acute abscess. If the acute stage of inflammation has passed off, and other circumstances render mercury advisable, it may be resumed; but it should not be given during acute suppurating bubo.

2. In treating the *scrofulous bubo*, the general health must be amended by every possible means; tonics, sarsaparilla, change of air, and especially a sea-voyage; and cold lotions when demanded by an aggravation of heat and pain. If these measures fail, and matter forms, it must be let out by one or more punctures. Or if the skin is extensively undermined, bluish, and thin, the process of cure will be hastened by an application of the potassa fusa.

In the same way, in treating the sore formed by opening a bubo, the first thing is to get rid of the loose red skin. This may be done (as soon as the part is becoming indolent and swelling is abated) by cutting it away with scissors, or by the potassa fusa. A solution of nitrate of silver is the best dressing afterwards.

Sometimes there remain one or two indolent enlarged glands projecting in the midst of the sore, denuded of skin, and incapable of forming healthy granulations. These may be destroyed by caustic in the following way:—An ounce of bread crumbs, two drachms of corrosive sublimate, and one drachm of red oxide of lead, mixed into a paste with a little water, may be made into conical troches of the shape of bread-seals; and one of these may be inserted into a puncture in the diseased gland, which it will speedily cause to slough.

Sinuses, if they are not soon healed by stimulating injections, may be slit up; and if the ulcer become *inflamed* or *irritable*, or if it be attacked by *sloughing* or *phagedæna*, the treatment must be adopted that has already been directed for similar ulcers in other parts.

SECTION VII.—SECONDARY SYPHILIS.

The symptoms of secondary, or constitutional syphilis, generally occur about six weeks after the primary symptoms; sometimes a fortnight, sometimes not for months. Before their appearance, the patient possibly becomes thin and wan; he looks dispirited; his eyes are heavy; and he complains of want of appetite and sleep, and of rheumatic pains.

The symptoms are usually first manifested upon the skin and mucous membrane of the throat, and then upon the bones. We shall first describe these several local affections, and then the treatment of secondary syphilis generally; but syphilitic affections of the eye and testis, which generally accompany those of the throat, will be treated of in the chapters that are particularly devoted to those organs.

SYPHILITIC ERUPTIONS vary in degree from the slightest discolouration to the most inveterate ulcers. 1. In the mildest form, the skin is mottled and stained in irregular patches of a brownish-red colour; which are caused by a slight swelling and vascular injection. A greater degree of the same derangement will produce *syphilitic psoriasis*, in which the skin is raised in copper-coloured blotches, covered with scales of hypertrophied cuticle. Or there may be an eruption of *papulæ* or pimples, varying in size from a pin's head to a pea. These eruptions are succeeded merely by scabs or exfoliations of the cuticle. Or there may be a copper-coloured mottling of the skin around the abundant pimples of *acne* on the back, breast, and shoulders.

2. *Scaly Eruption* (*Lepra syphilitica*) is an aggravated variety of the preceding. It begins with an eruption of copper-coloured blotches, which become covered with scales of enlarged cuticle; these are succeeded by scabs, and, when they fall off, by shallow ulcers with copper-coloured edges.

3. *Vesicular Eruption* (*Rupia*). Large flattened bullæ, filled with serum, which gradually become purulent, and finally dry into scabs, under which the skin is ulcerated. The ulcers spread under the scabs, and the latter become remarkably thick from successive additions, so as to resemble oyster, or limpet shells.

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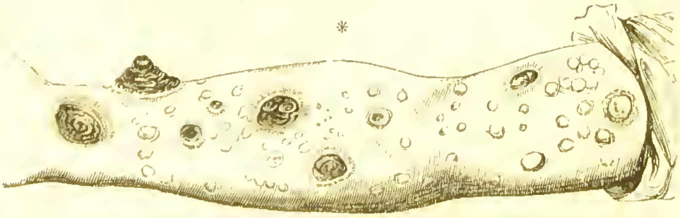

4. *Pustular Eruption* (*Ecthyma*). Large prominent pustules, with a copper-coloured base, leading to ulcers.

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* This cut exhibits the crusts of rupia; from a cast in the King's College Museum.

5. *Tubercular Eruption.* Broad, red, copper-coloured tubercles, forming most frequently at the alæ of the nose, or on the cheeks. They gradually suppurate, and are succeeded by deep irregular ulcers, terminating in puckered cicatrices, and more properly belong to the class of tertiary symptoms, in which mercury is almost inadmissible. This form of disease is most unfavourable, and usually appears at a considerable distance of time from the primary symptoms, in persons whose constitution is originally weak, or has been shattered by privation, dissipation, or frequent unavailing courses of mercury. A patch of this kind of unhealthy inflammation is apt to form on the tongue, and after a time an abscess breaks, disclosing a ragged excavation, filled with orange-coloured sloughs, and exuding a copious fetid discharge. If it occurs on the palate, a probe will detect bare exfoliated bone; which rapidly perishes and leaves a hideous chasm.

Mucous Tubercles (*Tubercule Muqueux*, *Pustule Plat*, *Condyloma*) constitute a peculiar eruption of the skin, and rank among secondary symptoms, although there is good ground for believing that they are themselves contagious, and that their secretions are capable of producing the like eruption in healthy persons. They consist of raised patches of skin, with a red and moist surface like that of mucous membrane, exuding a thin acrid and ill-smelling discharge. The most frequent situation is the neighbourhood of the genitals, or any other place where two surfaces of skin are in contact. They seem to consist of patches of psoriasis, modified by the moisture of the situation. The remedies are regular washing with soap and water; and the use of a dilute lotion of chloride of soda or of zinc, F. 127, after which the part should be sprinkled with dry calomel.

SYPHILITIC SORE THROAT.—1. The mildest variety is a superficial excoriation of the mucous membrane of the tonsils or some other part of the mouth or fauces, corresponding to psoriasis on the skin. The parts affected are swollen and sore, usually red and glazed, and stripped of the natural epithelium: this state may exist in a mere patch, or may extend all over the tongue, and inside of the lips. When attended with patches of thickened copper-coloured and vascular skin, and redness of the conjunctiva, and soreness of the nostrils and ears, it has a very characteristic appearance.

2. The *excavated* ulcer looks as if a piece had been scooped out of the tonsil. Its surface is foul and yellow, its edges raised, and ragged, and swelled. There is remarkably little inconvenience from it, and very little constitutional affection, unless it be attended with eruption likewise. The patient has a peculiar guttural way of speaking, and often complains of pain in the ears.

3. The *sloughing* ulcer begins as a small *aphthous* spot, which rapidly ulcerates, and is attended with great pain and fever. The surface of the ulcer is covered with an ashy slough, and the surrounding mucous membrane is dark, livid, and swollen. The lingual artery may be opened by the spread of the ulceration, and the patient may die of hæmorrhage, unless the common carotid is tied.

SYPHILITIC ULCERATIONS of the nose and palate commence with ulcerations of the mucous membrane, similar to those of the throat, which may denude the periosteum, and then produce exfoliation of the bones, with profuse fetid discharge and odious deformity. Ulceration of the nose generally begins with a sense of heat, and dryness, and snuffling.

Syphilitic ulceration of the larnyx is mostly caused by an extension of ulceration from the palate. It is characterised by tenderness, great huskiness of voice (which frequently degenerates into a mere whisper), suffocative cough, and expectoration of bloody purulent matter; there is great loss of flesh and strength, and life is often terminated by suffocation.

SYPHILITIC DISEASE OF BONE most frequently attacks the tibia, ulna, os frontis, clavicle, and other superficial bones. It commences with tenderness of the affected bone, and severe pain, which begins in the evening, and lasts almost all night, but ceases in the daytime. The pain is shortly accompanied with oblong swellings, called *nodes*, arising from infiltration of the periosteum with lymph and serum. These swellings are rather tender; they communicate a doughy feeling, or

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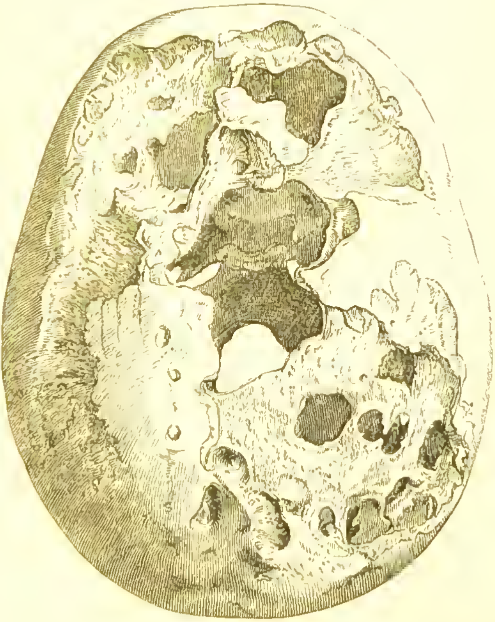

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* This cut shows the ravages of syphilitic caries. From the King's College Museum.

obscure sense of fluctuation to the fingers, and the skin over them is at first pale and moveable. If the disease is arrested at this stage, it causes merely a superficial deposit of rough porous bone, from the organization of the lymph effused; or else a consolidation of the bone itself through the deposition of fresh osseous matter into its cancelli. If the disease proceed one step further, a quantity of glairy serum is effused between the periosteum and bone, producing an exquisitely-painful fluctuating tumour. If it advance still further, the bone becomes carious; matter forms between it and the periosteum; extensive exfoliations ensue; the patient suffers severely from the pain and discharge; and if the disease be seated on the head (in which situation it is called *corona veneris*), death may ensue from irritation of the dura mater, or protrusion of the brain through apertures in the skull. Such aggravated cases are fortunately, however, now very rare; although common enough when mercury was supposed to be the only means of stopping the ravages of the disease.

DIAGNOSIS.—There is often some difficulty thrown into the surgeon's way by the denial of patients that they have ever had any primary symptoms. And this denial may be truthful enough, for a sore so small, or a bubo so slight, may have existed, that they escaped notice. If, however, the patient has a copper-coloured eruption, a sore throat, falling off of the hair, enlargement of the glands around the occiput, rheumatism in the joints, or periosteal nodes on the superficial bones, and a general faded unhealthy look, and these disorders are of recent date, and cannot be attributed to any causes connected with diet or residence, the probability is that they are syphilitic.

TREATMENT.—In the first place, if a venereal eruption and sore throat are ushered in with pain in the chest and febrile symptoms, it will be necessary to give aperients, and saline medicines, and confine the patient to the house. The warm bath will also be highly useful.

When the febrile state has vanished, if the patient has never taken a course of mercury,—or if he has been subjected to an imperfect course of it for the primary symptoms,—and his constitution is sound, he may take mercury after the manner directed in the fifth section. If, under its use, the strength and general appearance are improved, so much the better; but if the patient gets thinner, weaker, and haggard, and suffers from chills or feverishness, or if his ulcers become irritable and phagedænic, it must be given up. The corrosive sublimate in very small doses, F. 86, with bark or sarsaparilla, is useful in many protracted cases.

The iodide of potassium is the remedy next in efficacy to mercury, and should be administered when the former is deemed unnecessary or inexpedient. The salts of ammonia, F. 197, are worth a trial.

Sarsaparilla may almost always be used with advantage. It may be combined with corrosive sublimate or the iodide of potassium, or may be administered after a course of these remedies, to restore the flesh and strength. The mineral acids, especially the nitric; sedatives, especially hyoscyamus and conium, F. 34; tonics, F. 1, 2, 3, 4, 5, will be all of service in protracted cases. In these the surgeon will find it necessary to change and vary his remedies repeatedly. The main object should be to improve the general look and condition of the patient; to treat symptoms; never to push a remedy, if it does manifest harm, under the vague idea that it is specific; and never to attempt to produce sudden benefit by large doses of mercury, or other violent remedies which may weaken or impair the constitution.

Local Treatment.—For syphilitic eruptions, the warm, vapour, and sulphur baths will be often expedient. Obstinate patches of lepra or pimples may sometimes have their removal hastened by ung. hydr. nitratis diluted, or the ung. hydr. precipitati albi, or the ung. picis. Itching eruptions may often be relieved by a weak lotion of corrosive sublimate. Ulcers must be treated according to their condition, whether inflamed, irritable, or indolent. In general, weak mercurial applications, such as black wash, or weak red precipitate ointment answer best.

For the common excoriated sore throat, any soothing detergent gargle will do.—F. 107, 108. When there are ulcers, it is advisable to use gargles of corrosive sublimate (F. 112); and when the ulcers are indolent they may be touched with the *linimentum æruginis*. *Mercurial fumigation* may be used to the part affected. When a foul ulcer is seated on the velum, or roof of the mouth, or pharynx, or alæ nasi, an attempt may be made to check its ravages, by destroying its surface and edges with acid nitrate of mercury.

Ulceration of the larynx is occasionally benefited by similar fumigation, but mercury so as to affect the mouth is almost always injurious; as it is in other cases of rapid ulceration. Sarsaparilla and sedatives, blisters to the throat, and occasional leechings, swabbing with solution of arg. nit., and the operation of tracheotomy, if the breathing becomes much embarrassed, are the necessary measures.

The pain of nodes is often relieved by blisters, and so are rheumatic pains of venereal origin. Acute inflammation of the periosteum or pericranium is best treated by iodide of potassium, in doses of three grains every four hours, and Dover's powder; the use of mercury requires the greatest caution, and is only admissible if the patient has a sound constitution, and has never taken a course of it. It is peculiarly noxious when there is caries of the bones of the nose. When nodes are very tense and full of fluid, it may be necessary to puncture them, but it is better to adopt Mr. W. Fergusson's plan of subcutaneous incision, instead of direct puncture. If during secondary syphilis, the nose becomes tender or painful, the greatest benefit will be derived from the application of one or two leeches twice or three times a week to the inside of the affected nostril. At the same time the patient should take plenty of sarsaparilla, with iodide of potassium, and should have the benefit of country air, and a nutritious diet. By these means, any further mischief will sometimes be averted. If, however, ulceration does occur, it is of the utmost consequence to remove any loose or carious portions of bone as soon as possible.

SYPHILIS OF CHILDREN.—When a man labours under constitutional syphilis it is probable that he may communicate it to his wife; but, at all events, if the wife has it, she may communicate it to the fœtus in utero. The consequence is sometimes that the infant dies about the fourth or fifth month, and the woman miscarries repeatedly. Sometimes the child is born weakly and shrivelled, with hoarse cry, snuffling respiration, discharge from the nostrils, copper-coloured blotches or ulcers, especially about the anus and pudenda, and aphthæ in the mouth. Sometimes, again, it is born healthy, but these symptoms appear a month afterwards. Lastly, a child may be affected with primary syphilis during its birth.

The parents in these cases should have a course of mercury, and be treated in other respects for secondary syphilis. Moreover, if a woman has been repeatedly delivered of dead children from the fifth to the seventh month, and if there is reasonable suspicion of a lurking syphilitic taint, even though there be no overt symptoms, a mild mercurial course (p. 191) is advisable. And for the children, the best plan is to rub ten grains of mercurial ointment daily into the axillæ or soles of the feet, every night till the symptoms disappear. The prognosis is always favourable; and although the symptoms are apt to recur once or twice, they are in general easily removed by a short repetition of the remedy.

It seems to be extremely probable that a syphilitic infant may produce sores on the nipple of its wet-nurse, and constitutional syphilis afterwards. The sores are of the nature of *mucous tubercles* (p. 198), and they are most probably contagious, and capable of producing secondary symptoms. The treatment necessary is that which we have just referred to. For further particulars on this very curious question, we must refer to the before-quoted work of Dr. Egan.*

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* See also Diday on Infantile Syphilis, translated and published by the New Sydenham Society. Many opinions regarding syphilis will doubtless be modified by new researches. For instance, Mr. H. Lee (Lancet, Jan. 25, 1859) holds that the true adhesive Hunterian chancre is most difficult to produce by inoculation on the same patient; that its secretion is not *pus*, but a thin serum mixed with epithelial debris; that it may be made to suppurate by irritating applications, and that then its secretion, if inoculated, produces, not ulcers nor pustules, but little patches of adhesive inflammation, with a desquamating surface.

PART IV.

INJURIES AND SURGICAL DISEASES OF VARIOUS TISSUES, ORGANS, AND REGIONS.

CHAPTER I.

DISEASES OF THE AREOLAR TISSUE.

Of the diseases of the areolar tissue, the greater number have been already sufficiently described, when treating of the elementary processes of disease, and effects of injuries. We have nothing to add to our account of inflammation; abscess, acute or chronic; diffused or erysipelatous inflammation; œdema, ecchymosis, and scrofulous ulcer. Of the inflation with air we shall speak under the head of emphysema; and of the injection of irritant liquids under the head of extravasation of urine. This tissue is the favourite seat of a great variety of tumours, especially the fatty, painful subcutaneous, fibro-plastic and allied species, encysted, and cancerous; for the diagnosis and treatment of which we refer to the Chapter on Tumours. Cancer in this tissue, whether superficial or deep, is rare as a primary affection, and is usually of the soft variety; but no doubt many of the cases heretofore reported as cancerous have been fibro-plastic.

CHAPTER II.

SURGICAL DISEASES OF THE SKIN.

I. Hypertrophy of the entire skin, which increases in breadth and length so as to project in pendulous flaps or ridges, is sometimes seen, and is sometimes congenital. If inconvenient, the knife is the remedy.

II. Warts, or Vegetations, are diseases consisting in an hypertrophy of the papillæ and cuticle. (1.) The commonest variety is the wart which frequently grows on the hand or face of children, and which consists of lengthened papillæ, each containing a vascular loop, and clothed with dry, hard cuticle. If necessary to interfere, warts may be snipped off, or tied, or be touched with some of the caustics to be presently mentioned; but they often return obstinately, in spite of treatment, and disappear of themselves when let alone.

(2.) A second variety consists of hypertrophied papillæ, clothed with *thin* cuticle, especially apt to come on the inside of the thighs, perinæum, about the anus, within the prepuce, and in similar situations on and near the genitals of either sex, especially the female. Some are highly vascular, and easily bleed; some are pale and indolent; some broad and flat; some tall and stalked; all discharge a thin sour ichor; and are caused by the irritation of the discharges of gonorrhœa or of syphilis, combined with that of the natural perspiration of uncleanly persons. They may grow on the site of a healed chancre. These warts are commonly called *venereal warts*, because they are doubtless caused by the irritation of venereal discharges; they sometimes also are contagious, and may produce similar warts in healthy persons. But they do not of themselves give rise to *secondary syphilitic* symptoms, nor do they require mercury.

Treatment.—If daily washing with soap and water, and with chloride of zinc lotion, F. 127, does not suffice, the most efficacious plan is to cut off all the morbid growths with the knife or curved scissors; and apply an astringent lotion during the cicatrizing state. If they grow again, they may be touched with nitrate of silver, or some escharotic, such as one drachm of muriatic acid with three drachms of muriated tincture of iron; liquor plumbi diacetatis; creosote, or the acid nitrate of mercury.

(3.) A third variety is the wart which comes on the face or some other part of the skin of elderly persons, and, after a time, becomes the seat of epithelioma. With this may be classed the chimney-sweeper's wart of the scrotum, the warty growths which are the first stage of so-called *cancer*, *epithelial cancer*, or *cancroid* (or properly speaking, *epithelioma*), of the lip and penis, and the *warty tumour of cicatrices*, described by Cæsar Hawkins, which begins as a simple wart on the site of an old scar, increases, ulcerates, throws out huge fungous masses; contaminates the glands, and causes death by the pain and exhaustion of foul ulceration.* See *Epithelioma*, p. 105.

III. CORNS are growths of thick cuticle, not merely lying *upon* the true skin like *callosities*, but penetrating into it. They are produced when the skin, situated over some projecting point of bone, is irritated by pressure or friction. Their usual seat is on the joints of the toes, and tight boots or shoes are their usual cause. They are divided into two kinds, the hard and the soft. The hard are situated on the surface of the foot, where the cuticle can become dry and hard; the soft between the toes, where the cuticle is soft and spongy. We must observe, however, that what are called *soft corns* between the toes, are not always corns, but excessively irritable fungous warts, and consist of a growth from the cutis vera, not of a mere thickening of the cuticle.

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* Cæsar Hawkins, Med. Chir. Trans. vol. xix.; R. W. Smith, Dublin Quarterly Jour. Med. Sc., May, 1850; Hannover, Epithelioma, &c.

Treatment.—The points to be attended to are, to have the boots or shoes properly adapted to the shape and size of the feet;—to wash the feet every night, and to rub the corns every morning with a little Naples soap, or some other kind of soap just moistened. If very painful they may be poulticed at night, and kept moist by day with glycerine, so that they may be kept soft and pliable, not hard and dry. If these measures be adopted, and the part relieved from pressure, the corn will soon peel off.

But some feet are so misshapen originally, or the toes are so crowded together by wearing small, low, pointed shoes, that it is impossible to contrive any shoes that will not press and create corns somewhere. In some of these cases the application of a plaster of thick soft leather, having a hole punched in it to receive the corn and relieve it from pressure, is a very useful device. If the corn is on the sole of the foot, a piece of felt, or small fold of flannel may be arranged so as to relieve it from pressure. For the soft corns between the toes, and for very irritable corns, the nitrate of silver is the best application. When a corn inflames, and matter forms beneath it, the pain is most excruciating, and only to be relieved by paring it down and letting out the fluid.*

IV. HORNY TUMOURS are formed by an inspissation of the matter of the sebaceous follicles, and by laminated growths of epithelium from their interior. They are easily removed by two oval incisions.†

V. WENS are encysted tumours, most common on the head, face, and shoulders, consisting of obstructed sebaceous glands (whose orifice may often be found in the form of a small black spot or crust), or else of erratically-developed cutaneous cysts. The matter contained is a collection of epidermic scales with hairs, oil-globules, and crystals of cholesterine, and has received the name *atheroma* or *steatoma*, from its resemblance to gruel or suet. Distension, suppuration, ulceration, and fungous granulation of the interior of the cyst sometimes occur. If an aperture is visible, and the tumour is not very large, it may be gently opened by a probe or director, and the contents be pressed out. Otherwise, it may be extirpated entirely by running a scalpel through it, seizing the cut edge of the cyst, and gently tearing it out with a touch or two from the knife. But two cautions are necessary. One is, not to tamper with or irritate such tumours; and another, not to excise them when the patient is out of health, or when they are inflamed.

VI. CHELOID TUMOUR.—This consists essentially in an hypertrophy of the tissue of the true skin, intermixed with fibro-plastic matter. It presents itself in the form of one or more projecting tumours, or of thickened reddish patches, in the substance of the skin. The most frequent situation is the chest; but such tumours are partial to the site of cicatrices (especially in people of colour), and are often multiple. Occasionally superficial ulcers occur; but in most cases this disease leads to no ill consequence. It is extremely liable to return after extirpation. Iodine and arsenic should be cautiously tried, F. 94, 97.*

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* Brodie, Lecture on Corns. Med. Gaz. vol. xvii. p. 775; Key on Bunion, Guy's Hosp. Rep. vol. i. p. 416.

† Vide Erasmus Wilson, Med. Chir. Trans. vol. xxvii.

VII. MOLLUSCUM.—A malady consisting in the development of numerous tumours on any part of the body where hair grows; varying in size from that of a small shot to that of an orange; hard and painless; either imbedded, or prominent and stalked; sometimes exuding a milky fluid from a minute aperture; consisting, according to Dr. L. Beale, of an alteration of the hair follicles, and hypertrophy of the areolar tissue. Probably the chloride of arsenic, if resorted to early, might cause diminution of the tumours (F. 97). But if one or more becomes very inconvenient, it may be cut out.†

VIII.—MOLES.—Oblong patches of imperfectly-organised skin with black matter in its interstices, small vascular patches, and other congenital imperfections of the skin, should be extirpated, if at any time they seem inclined to spread and become irritable, because it is possible that they might become the nidus of epithelioma, or of cancer. The health should be carefully watched under such circumstances.

IX. CANCER of the skin may be a result of the propagation of the disease from the breast, or from some gland; or may be primary. Sometimes it affects the scirrhous form, and presents itself in the shape of one or more hard tubercular dull-red masses; sometimes it begins as an innocent-looking, but rapidly-growing wart, which speedily assumes the characters of soft cancer; bleeds or exudes a sanious liquid, and contaminates the nearest glands. The melanotic variety is also common. It is a frequent occurrence that cancer is deposited in warts, moles, and similar growths; and it is possible that it may be combined in one tumour with epithelioma. For the clinical history and treatment we must refer to the Chapter on Cancer.

X. BOIL (*Furunculus*).—A circumscribed round hard swelling, depending on inflammation of one spot of the true skin, and on the deposit therein of unhealthy lymph; usually attended with the acutest pain and tenderness; and ending in suppuration, and the discharge of a flake of softened lymph, and a small sloughy shred of areolar tissue, which form what is called a *core*. It is caused by blood disorder, from unwholesome food, or from unknown epidemic atmospheric causes, or from depressing influences generally. It may be acute, with great pain, swelling, and fever; or chronic, indolent, hard, and slow to suppurate; or may come out in crops, one coming so soon as the preceding one is healed.

Treatment.—If acute, poultices; and so soon as suppuration is fully established, a clean cut with a sharp lancet: if, however, the lump be indolent, incision does no good; during the last stage of the acute, and during the whole course of the chronic, stimulating applications, such as resin or Peruvian balsam ointment; or painting with tincture of iodine. The constitutional treatment must be at first eliminative; that is, the bowels should be emptied, and the tongue cleaned by a grain or two of calomel, &c., F. 37 or 38; and the diet should be regulated; but if successive crops come out, alteratives and tonics should be given. The liquor potassæ in drachm-doses twice daily (or the liq. sodæ, which cured John Hunter) has a good reputation in these cases; but of late years it has more frequently failed than not, and it appears that tonics, especially the preparations of bark with acids, F. 1., &c., are the most useful remedies. When there is no obvious derangement of the general health which may serve as a key to the treatment, and when general remedies fail, a thorough change of air should be tried. The writer has effected many cures by sending the patients to Paris, after a short course of tonic and alterative treatment.

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* Warren on Tumours, p. 40; Burgess's Translation of Cazenave, p. 365. Mayo's Pathology, p. 236; Lebert, sur les Maladies Cancéreuses, p. 652.

† Bateman, Cutaneous Diseases; Lionel S. Beale, Pathological Trans. vol. vi.

XI. CARBUNCLE (*anthrax*) is an exaggerated boil, or a collection of boils. An oval or irregular portion of skin, varying in size from that of a hazel nut to that of an egg; or, perhaps, very much larger, becomes infiltrated with unhealthy lymph, forming a hard, dull-red swelling; very tender, with a heavy aching pain. After a few days of gradual increase, softening and suppuration occur at several parts, which become of a duller red, and more prominent, and yield an obscure sense of fluctuation. Then follows ulceration of these points, forming round apertures, giving exit to a thin ichor; but if pressure be made, a thick glutinous matter may be squeezed out. The ulcerated apertures enlarge and meet; much viscid stuff is discharged, mixed with softened fibrinous exudation, and with sloughs of the areolar tissue, and the wound slowly granulates and heals. Such is the course of carbuncle, if left to itself. It is always an indication of vitiated blood, and has the same series of causes as the boil, and more especially some utterly unknown cause, which has produced a most extensive visitation of these maladies during the last few years. When large, especially if situated on the head or face, it is liable to be attended with violent fever, followed by great, and, perhaps, fatal prostration of strength. The *treatment* is that of erysipelas. Since it is a blood disorder, efficient means should be taken at first to produce a full discharge of bile and urine, F. 33, &c. The strength should be kept up by soup, and brandy or wine, at discretion. So soon as the secretions are in a state to permit of it, opiates should be given to allay pain, and bark with nitric acid to recruit the strength. Fomentations and poultices should be used to hasten suppuration. In some cases it is beneficial to cut through the swelling whilst hard and brawny; but it is usually better to defer this till suppuration has commenced, and then thoroughly to cut through the infiltrated tissues, and insure a free discharge of all pus and sloughs; after this to apply warm poultices with the resin or creosote ointment.

CHAPTER III.

DISEASES AND INJURIES OF MUSCLES, TENDONS, AND BURSÆ.

I. SIMPLE ATROPHY of muscle, with more or less fatty degeneration, may arise from want of exercise, however caused. Moreover, it sometimes happens, that after a fever, or after injury, or disease, or exposure to cold, or after some affection of the nervous centres, one arm, or one leg, or both legs are smitten, as it were, with a blight. The affected member is always chilly; its skin is numb: it is imperfectly nourished, and decreases in bulk; if the patient is young, it ceases to grow in proportion with the other parts of the body; and its flexor muscles often become affected with rigidity, so that the joints are immovably bent and contracted.

Treatment.—Steel, quinine, cod-liver oil, and other tonics; warm clothing and liberal diet; stimulating frictions, affusion with cold water, passive exercise, shampooing, and electricity or galvanism, so as to keep the muscular fibrillæ exercised.

II. INFLAMMATORY SPASM is a malady of which the commonest example is the *stiff neck*, or rheumatic inflammation and spasm which affect the muscles of the neck after exposure to cold, in persons whose blood is imperfectly purified. But it may affect any other muscles. Purgatives and fomentations usually soon produce a cure. We may remind the surgeon of the frequent occurrence of—

III. MUSCULAR SPASM as a symptom either, 1st, of irritation of the bowels or other internal organs; or 2ndly, of disease in the nervous centres.

Of the former class of cases, spasm of the sphincter ani, of the muscles of the hip, and of other parts in children whose intestines are loaded, are examples. Of the latter, the spasm which attends hemiplegia, with irritation of the brain.

IV. RIGID ATROPHY is a state in which a muscle becomes short, rigid, and inextensible; generally causing displacements and deformities of the parts to which it is attached. *Causes.*—1st. It may be induced by *long inactivity* of the antagonist muscles;—thus, after long-continued disease of the knee, the flexor muscles of the ham may become shortened and inextensible, keeping the joint permanently bent, and often dragging the tibia off from the condyles of the femur. 2ndly. It may be a sequel of *habitual spasm*, by whatever cause produced.

Treatment.—In the early stages, friction, shampooing, and mechanical extension. But in cases of long standing, the only remedy that can be relied on is *division* of the affected muscle or of its tendon; by which means the divided parts will retract; they will unite by lymph, and will consequently be lengthened, and then extension may be practised with greater efficacy. (See *Clubfoot* and *Wry Neck.*)

V. ACUTE ATROPHY.—In this affection one or more muscles rapidly waste away, and their wasting is attended with severe pain, especially in the course of their nerves. It appears to depend on rheumatism of the muscular nerves, and to be caused by cold.*

VI. Rupture of Muscles and Tendons.—This is an accident which is frequently caused by violent muscular contraction; especially if, after illness or long inactivity, the muscles are subjected to sudden and severe exertion. The muscles which are most frequently ruptured are, the gastrocnemius, the rectus femoris, which sometimes is entirely detached from the patella,† and the biceps flexor cubiti; but more frequently the tendons give way, especially the tendo Achillis, and flexor tendons of the wrist.

The *symptoms* of this accident are, sudden pain, and sometimes an audible snap. The patient cannot extend the tendon as he can in the opposite limb. A depression may be felt with the fingers at the ruptured part.

The reparation of ruptured tendons, and of tendons divided by subcutaneous section, is accomplished by the exudation of lymph between the severed extremities and into their sheath. This quickly sets into a homogeneous substance, minutely granular and studded with elongated nuclei, which speedily assumes the fibrous characters and consistence of tendon.‡ This process proceeds best when unaccompanied with extravasation of blood, or with inflammatory exudation.

Treatment.—The main point is to keep the injured part in a state of constant rest and relaxation,§ so that the severed ends may be in close approximation, and to prevent any violent extension till union is firm. When the tendo Achillis, or the gastrocnemius muscle is ruptured, the knee may be kept bent by a string passing from the heel of the slipper to a bandage round the thigh. For ruptures of the extensors of the thigh, the limb must be placed in the same position as in fracture of the patella. If the biceps is ruptured, the elbow must be kept bent to its utmost; if the tendons about the wrist or fingers, the forearm must be confined by a splint. After three or four weeks of rest, the surgeon may use *passive motion;* that is, may bend and extend the joints of the injured limb with his hands several times successively. But the patient must be cautious in using the muscle for a long time; and (if it be the tendo Achillis) must walk with a high-heeled shoe for two or three months; so that the recent callus may not be stretched and lengthened, which would cause permanent weakness.

VII. Strains.—A strain signifies a violent stretching of tendinous or ligamentous parts, with or without rupture of some of their fibres. It produces instant severe pain, often attended with faintness; and great tumefaction and ecchymosis; with subsequent weakness and stiffness. If the part is not kept at rest, or if the diet is intemperate, or the blood impure, or if the knee or some other large joint is affected, there will be great pain, inflammation, and fever, that may lead to serious or even fatal results.

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* Two cases of it are given in Mayo's Pathology, p. 117. The author has seen several, which all attempts have failed to cure.

† Vincent, op. cit. p. 71.

‡ See Mr. William Adams's account of the Reparation of Tendons, Trans. of the Pathological Soc. vol. vi.

§ Muscles are to be relaxed by putting them into a position the reverse of that which they occupy when in greatest action—not by merely approximating their attachments. Vincent, p. 11.

Treatment.—The most essential measure is perfect rest; and to insure this, the patient should go to bed, and if the part affected be the knee, it should be confined by a pasteboard splint. During the first day or two, the object is to allay pain, and to anticipate inflammatory effusion. Warm fomentations, henbane, an aperient, and plain diet are the measures. If *inflammatory* pain (that is, throbbing heat and swelling, not the mere pain of the injury) should be developed, leeches should be applied; otherwise not. Then the best thing is to protect the part by a firm bandage, so that the reparative process shall not be disturbed; and once daily to foment it well with hot water, and rub it with a stimulating liniment. If after a sprain, the part injured is liable to fits of inflammation, and very slow in recovering its powers, treat it as if chronic rheumatism (p. 41) by iodide of potassium.

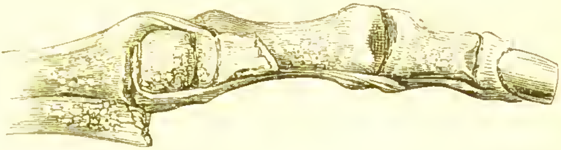
VIII. Acute Inflammation of the Sheaths of Tendons and Fasciæ is generally caused by punctured wounds, especially by puncture of the fascia of the biceps during venesection; and by punctures of the fingers, inflammation of the tendinous sheaths of which is called *thecal abscess; paronychia gravis*, or *tendinous whitlow.* It is attended with severe, tensive, throbbing pain; exquisite tenderness; slight, but tense and resisting swelling; and very great constitutional disturbance. It may lead to suppuration; the matter extending itself along muscles and tendons, from the fingers to the forearm, causing sloughing of the tendons, severe irritative fever, life often obliged to be saved by amputation; or the limb, if preserved, stiff and useless.

Treatment.—If the pain and tension increase, notwithstanding the employment of leeches, fomentations, and purgatives, *free incisions* must be made through the inflamed parts; in order to give vent to matter, if it have formed, or by creating a free discharge of blood to prevent its formation.—See *Whitlow.*

IX. Contraction and Rigidity of the fasciæ are exemplified in *contraction of the palmar fasciæ.*—See the Index.

X. Tumours on Tendon and Ligament.—Small fibrous tumours, about the size of a pea, are apt to form on the tendons or fasciæ. Sometimes they follow a strain. The author knows an eminent musician, on whose palmar fascia such small tumours appeared after a painfully long practice at the piano; but they often arise without any specific exciting cause, probably from some rheumatic taint. The iodide of potassium is the best remedy, F. 94.

XI. Chalkstone Deposits are composed of the lithate of soda; a white insoluble substance, which in gouty subjects is frequently deposited into the texture of the bones, joints, and cellular tissue, but most frequently into the cellular tissue that environs the tendons of the feet or hands. These deposits may be permeated by exquisitely-sensible threads of cellular membrane. After remaining indolent for a variable time, they may inflame the superjacent skin, and cause the formation of ulcers that are extremely obstinate, and discharge vast quantities of the concretion. They must be treated with simple dressings. It is rarely expedient to meddle with these tumours with the knife; but if any one be very inconveniently situated, and be perfectly indolent, it may be extirpated. The wound must be expected to heal very slowly.



XII. GANGLION.—This is an encysted tumour formed by the sheath of a tendon, or by a new cyst developed in one of the fringes of the synoval sheaths, or by a bursa, whether original or created by friction. When recent, it is an indolent fluctuating tumour, transparent enough to permit the light of a candle to be seen through it. It contains a clear synovia; thin, or viscid and semifluid. The ordinary situation of ganglion is that of the various bursæ; on the patella or olecranon, or on the inner side of the head of the tibia, or the angle of the scapula; but most frequently about the wrist and fingers. When the general sheath of the flexor tendons at the wrist is affected in this way, it forms a remarkable tumour, which projects in the palm of the hand, and also above the wrist, but is bound down in the middle by the anterior annular ligament of the carpus. Considerable pain and weakness are caused by these swellings. When ganglion has lasted some time, or has been subjected to inflammation, the cyst becomes thickened, and the tumour loses its softness and transparency. The ordinary cause of ganglion is a twist or strain of some kind, or irritation from pressure or friction, or some unknown constitutional tendency.

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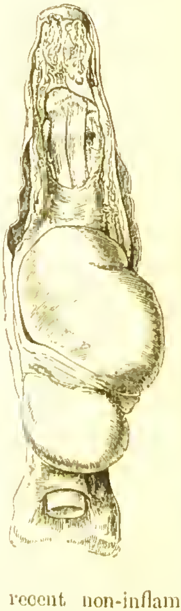

Treatment.—(1.) The best plan of treating recent non-inflamed ganglion seems to be, either to burst it by pressure with the thumbs, or to puncture it with a grooved needle, or else to make a subcutaneous incision into the sac; that is, to introduce a needle with a cutting point, and to turn the point against the inside of the sac and divide it, without, however, making a larger wound in the skin than is necessary to introduce the needle. The object of these operations is to empty the sac, and form an aperture by which its contents may henceforth pass into the cellular tissue and be absorbed. As soon as it is emptied, constant pressure should be applied by means of compress and bandage, which may be wetted with cold lotion, if agreeable. (2.) If this plan fails, recourse may be had to blisters, friction with mercurial and other stimulating liniments, or Scott's ointment, F. 160, or the *iodine paint*, F. 89. (3.) In obstinate cases, if it is a bursa (as over the patella or olecranon), and has no connexion with the sheaths of tendons, it may be dissected out. (4.) But if the bursa is large or deeply seated, as over the angle of the scapula, it may be freely cut into and emptied, after which it will probably heal up. (5.) In obstinate cases, especially if the cyst is much thickened, a puncture may be made, and a few threads of silk, or a wire, be passed through the sac as a seton. This destroys the secreting power of the sac, and effects a radical cure, but the operation requires great discretion, as it may be dangerous to life. (6.) Ganglion of the flexors of the wrist should not be tampered with incautiously. If an operation is necessary, Mr. Fergusson prefers a free incision, as less dangerous than puncture. (7.) Mr. Wickham strongly recommends the vapour bath, or local steam bath, as a means of getting rid of thickness and stiffness after these operations. Lastly, any rheumatic or gouty tendency should be corrected by proper medicines.*

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* A ganglion, formed by the synovial sheath of the flexor tendon of a finger.

XIII. ACUTE INFLAMMATION OF BURSÆ is most frequently exemplified in the affection called the *housemaid's knee*, which is an acute inflammation of the bursa that intervenes between the patella and skin, common enough in that class of females, from kneeling on hard damp stones. It causes very great pain, swelling, and fever; it may be distinguished from acute inflammation of the synovial membrane of the knee-joint, by observing that the swelling is very superficial, and in front of the patella, which is obscured by it; whereas in inflammation of the synovial membrane of the knee, the patella is thrown forwards, and the swelling is most prominent at the sides.

Treatment.—Rest, leeches, fomentations, and purgatives; by which, if the pain and swelling are not relieved, a free incision should be made into it.

XIV. LOOSE CARTILAGES, and melon-seed shaped excrescences, are sometimes formed in the synovial sheaths of the hand and foot as they may in the joints. They may be removed by subcutaneous incision. See p. 267.

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* See an abstract of a paper by Coulson, in Ranking, xiv. 279.

CHAPTER IV.

DISEASES AND INJURIES OF THE LYMPHATICS.

I. ACUTE INFLAMMATION of lymphatic *glands* has already been exemplified when speaking of bubo. The inflamed gland enlarges rapidly, and forms a hard, tense swelling, with great pain and fever. If it suppurate, there may be shivering, delirium, and intense constitutional disturbance, till the pus is evacuated. The affection may be caused, 1. Like any other acute abscess, by constitutional disorder. 2. By local violence, such as blows or kicks. 3. By the irritation or absorption of acrid matter from ulcers, or eruptions of the skin. 4. By simple injuries, a clean prick, for instance, in persons whose health is deranged. 5. By punctures inoculated with some irritant fluid, perhaps from a putrid body.

When the disease arises from ulcers or punctures, the inflammation generally begins in the lymphatic *vessels* leading to the glands, which appear as red lines under the skin, and feel hard, cordy, and tender. If one of the fingers has been poisoned, there will be inflammation at the seat of injury, tender red lines extending up the front of the forearm, and a tender enlarged gland just above the inner elbow.

When pain and fever are intense, it will be right to apply leeches, and afterwards warm fomentations; but in most cases, especially when the cause is constitutional, and the disease is allied to idiopathic abscess, it will be better to induce suppuration as soon as possible, by fomentations and poultices; and so soon as pus has formed, it should be discharged by free incision. The constitutional treatment must include moderate purgation, vegetable salines, F. 58; and the other measures directed for acute abscess, and for dissection wounds.

II. CHRONIC ENLARGEMENT of these glands, is 1, most frequently caused by deposit of exudation in scrofulous persons. One or more glands become enlarged; usually the submaxillary or cervical; during the early years of life they may suppurate, or the swelling may entirely subside, or may remain during the whole of life.—See *Scrofulous Diseases.*

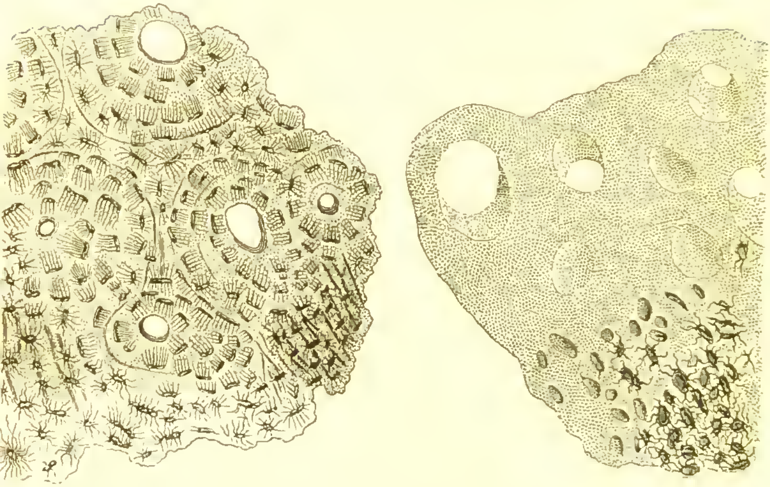
2. *Hypertrophy*, or infiltration with fibro-plastic matter, may convert one or more glands, especially in the neck, into hard, indolent, slowly-growing tumours; to be treated by cod-liver oil and iodide of iron or of potassium; and if these fail, by the knife.

3. *Cancer* of the lymphatic glands is usually a secondary affection, as we have before described. More rarely they are the primary seat of the disease, which then is more frequently soft cancer than hard. The diagnosis at first may be difficult, especially between soft cancer commencing in young subjects, and any other form of enlargement. But the rapid progress of the soft cancer, and the failure of health, which is sure to ensue after a certain time, will be leading distinctions.

CHAPTER V.

DISEASES AND INJURIES OF THE BONES.

SECTION I.—DISEASES DEPENDING ON HYPERTROPHY.



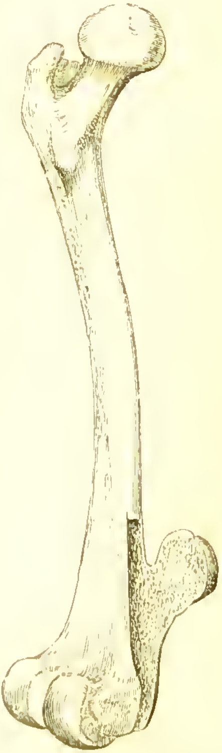
I. Microscopical Characters of Diseased Bone.—When a thin transverse section of healthy bone is examined under a good microscope, the observer readily distinguishes some large round or oval apertures—sections of the Haversian canals which convey the blood-vessels. Around these the bone—an obscurely-granular substance—appears to be arranged in concentric laminæ, containing amidst the laminæ the bone cells, with the canaliculi or minute pores projecting from them. Larger vacuities in the bone, visible to the naked eye, contain the marrow and veins. Now it appears, from the researches of Mr. Tomes and of Mr. Campbell de Morgan, that bone during life is in a state of constant absorption and renewal. Fresh Haversian canals are being incessantly tunnelled out in the solid bone, and older ones are filled up. This is evident from the numerous gaps and breaks in the laminæ, from the irregular and eroded edges of some of the Haversian canals, and from the evident way in which new and small Haversian systems are intruded into larger pre-existing ones. The soft parts which fill the medullary cavities, and the Haversian canals, thus evidently have the power of absorbing the bone with which they are in contact.

The microscopical changes observed in diseased bone consist in differences in the quantity and quality of the bone structure, and in the nature of the substances which fill its cavities.

Thus 1st, in bone which is unusually dense and heavy, with few cavities visible to the naked eye, the minutest structure is also condensed, the Haversian canals small, the corpuscles opake, and arranged in well-marked laminæ. 2ndly. In bone which is loosened out and spongy, the Haversian canals are large, the laminæ ill defined, the corpuscles ill developed; as in the second figure, p. 214.

3rdly. The medulla and other structures which fill the bone cavities, may be variously diseased; they may be congested; the fat cells may be atrophied; or replaced by inflammatory exudation tubercle or cancer, and the bone may be infiltrated with free oil.*

II. SIMPLE HYPERTROPHY.—It sometimes happens that one or more bones increase in length and breadth, without any deviation from their healthy structure. Thus the tibia, or fibula, or femur, has been known to become enlarged and lengthened after some disease which has brought an increased flow of blood to the limb; and the superior maxillary bone has been converted into a solid mass with complete obliteration of the antrum. The deviation from common nutrition on which such enlargements depend, is hardly to be controlled by medicine, although, if any drug is likely to be of service, it is the iodide of potassium.



III. EXOSTOSIS signifies a tumour formed by the irregular hypertrophy of bone. Such tumours are hard, painless, and globular, and mostly situated on the upper part of the humerus, or tibia, or on the lower part of the femur, near the insertion of the adductor magnus. Their *shape* is sometimes broad and flat; sometimes rounded and prominent, with a narrow neck. Their *structure* is that of ordinary bone, sometimes dense and compact, especially when they grow from the frontal or temporal bones; sometimes porous in the centre, with a thin external cortex. Sometimes they result from the ossification of a fibrous, or fibro-plastic, or cartilaginous tumour of the periosteum; sometimes they are bony from the first, and are formed, as it were, by a development of one particular part of a bone, perhaps a natural process or spine. The preceding figure is an illustration. They cause no pain, unless they happen to press on nerves or arteries; but they may by their bulk interfere with the functions of various important parts, and give rise to the most serious evils. When situated on the inner surface of the skull, they may cause epilepsy; in the orbit they may cause the eye to protrude on the cheek; they may obliterate arteries, and impede the action of muscles, and the movements of joints. Sometimes they arise without any very obvious cause; occasionally they originate in a blow, or strain, or in an unnatural degree of pressure on a bone thinly covered by soft parts.

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* See a paper by Mr. Tomes and Mr. De Morgan on the Structure of Bone, Phil. Trans. 1852, and a review of it by R. Druitt in the Brit. and For. Med. Quarterly for 1853; and Wedl, Patholog. Histology, published by the Sydenham Society.

Treatment.—In the first place, an attempt may be made to procure absorption of the tumour by means of iodide of potassium and friction with ointment of mercury or iodine. The more recent the tumour, the more effectual such measures are likely to be. In some cases, (especially if the complaint follow a blow) a moderate course of mercury, so as barely to affect the mouth, will be effectual. If these measures do not succeed, the tumour may be removed by operation, if requisite on account of the inconvenience it produces. If it is globular, with a narrow neck, it may be cut down upon, and be sawn or chiselled off, or cut off with a gouge. But supposing that its base is broad, so that this cannot be done, its periosteum may be shaved off; after which it will probably perish by necrosis, or else waste away; or the nitric acid, or potassa fusa, may be applied to its surface, to cause it to exfoliate. But these operations are not to be undertaken without due forethought; for they may be followed by extensive inflammation and necrosis, or by suppuration into a joint; and in operating on an exostosis near a joint, the possibility of opening the synovial membrane, should always be considered. Exostoses of the clavicles of children almost always disappear of themselves.*

SECTION II.—DISEASES DEPENDING ON ATROPHY AND DEGENERATION.

1. ATROPHY of the bones is marked by a diminution of their weight. Sometimes it is attended likewise by a decrease in bulk; but sometimes, whilst the outward bulk is nearly unaltered, the proper substance is withdrawn, the cortex being reduced to a thin shell, and the cancelli to a few fine threads with their interstices filled with fat. Atrophy may be caused by disuse and want of exercise simply; by disease of an adjacent joint; by interruption to the supply of arterial blood; (thus, after fracture with division of the medullary artery, the lower part of the tibia and femur, and upper part of the humerus, may undergo atrophy;) by that peculiar defect of nutrition which sometimes causes all the structures of a limb to be withered and blighted;

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* Vide Sir A. Cooper on Exostosis, in Cooper and Travers's Surgical Essays; Mayo's Pathology, p. 11; Stanley on Diseases of the Bones, Lond. 1849; T. B. Curling on Atrophy of Bone, Med. Chir. Trans. vol. xx.

(vide p. 208), by old age; and by the peculiar state of the system which accompanies rickets and mollities ossium.

11. RICKETS, OR RACHITIS, is a peculiar unhealthy condition of the whole body, arising from hereditary taint, or else from defective hygienic conditions, and especially from want of fresh air and of bright light. It is frequently attended with scrofulous disease; but its leading characteristic is the imperfect development, atrophy, and distortion of some or many of the bones. These are soft, and consist of "a sort of cartilaginous tissue, which will bend without breaking, and through which a knife may be readily passed." According to Messrs. Tomes and De Morgan, rickety bone has the structural arrangement of bone without the impregnation with earthy salts. The articular extremities of the bones are often disproportionately large. The shafts are unable to support the weight of the body without bending. In moderate cases, the ankles only may be a little sunk, or the shins bent, or the spine curved; but in aggravated cases the physiognomy and general appearance are very peculiar. The stature is stunted; the head large, with a protuberant forehead. The fontanelles are slow in closing; the face small and triangular, with a very sharp-peaked chin, and projecting teeth; the chest narrow and prominent in front, whence the vulgar term *pigeon-breasted;* the spine variously curved; the pelvis small; the promontory of the sacrum and acetabula pressed together, rendering the cavity perilously small for child-bearing; and the limbs crooked, their natural curves being increased. Hypertrophy of the white substance of the brain, and persistence of the thymus gland to a later period than natural, are said to be accompaniments of rickets. This disorder generally attacks the children of the poor from the second to the tenth or twelfth year of their age. After puberty, it is astonishing how firm the bones become, and, in particular, how they are strengthened by strong ridges developed on their concave sides.

Treatment.—The health must be invigorated by sunlight, pure air, animal food, cod-liver oil, iron, and the other measures prescribed for scrofula. To these remedies, the author recommends *phosphate of lime* to be added, F. 201. When a child with crooked legs is brought to the surgeon, he should ascertain whether the deformity arises from relaxation of the joints merely—the bones remaining straight—or from crookedness of the bones themselves. For the knees and ankles may be greatly bent inwards from the former cause, but will become straight of themselves when the health becomes stronger, especially if salt bathing and frictions are used to the legs and back. But if the tibia or femur are actually bent, the surgeon must take care not to tell the parents that the child will *grow out of it ;* for there is no evidence that a bone which has once yielded can ever recover its primitive shape spontaneously. Therefore some mechanical contrivances should be used, in order both to straighten the bent bones, and to keep them so till they are strong enough to bear the weight of the body : and a pair of simple wooden splints, well padded, and applied with some degree of tightness, from the top of the thigh to the foot, seem to answer every useful purpose, and the child soon learns to walk about in them with his knees straight. They should, of course, be taken off once daily for a good washing and rubbing.*

III. MOLLITIES OSSIUM (*Malacosteon*, *Osteomalacia*) is a disease generally, but not invariably, affecting elderly females, in which the bones become softened and brittle, and lose their earthy constituents. In the very first stage, the affected bones are softened and extremely vascular. As the disease advances they become somewhat thickened, and so soft as to be easily cut with a knife. On a section being made, the osseous tissue is found nearly absorbed, a mere shell being left, which in most cases is filled with " a dark grumous matter, varying in colour from that of dark blood, to a reddish light liver colour." Under the microscope the Haversian canals are found to be dilated, the osseous cells diminished, and the colour to be owing to the numerous oil-globules with which the bone abounds, and to the presence of blood pigment. As the disease advances, the affected bones seem to be reduced to mere thin shells, filled in some cases with serum, in others with fat ; whilst in some instances all bony matter whatever has disappeared, and the periosteum has been left as a cylinder filled with a dark fatty substance of the consistence of liver.

The disease is evidently constitutional, and usually affects almost every bone in the skeleton, although two instances have been reported to Mr. Solly, by Mr. Hodgson, of Birmingham, in which it was confined to the lower extremity ; and in one of these, amputation was performed. Moreover, it is liable in women to affect the pelvis, either alone, or before any other part. At the commencement of it, the patient is observed to be out of health, emaciated, complaining of violent achings in the bones, and of very great feebleness and profuse perspirations. Then from a fall or some other slight injury, a bone breaks ; perhaps it unites again ; but afterwards bone after bone breaks from the slightest cause ; the weakness increases, and the patient becomes bedridden ; and now, as the bones bend or break from the slightest influences, the chest and limbs become distorted to an almost inconceivable degree, and death at last occurs from exhaustion, or from the obstacle which the distorted ribs oppose to the action of the lungs. The fatal issue may not occur for several years, in the less severe cases. Softening of the bones of the pelvis in women is indicated by violent aching pains about the hips, and pain or difficulty in walking.

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* See Bishop on Deformities, Lancet for 1846, vol. i.

Of the *causes* of this disease, nothing is known, and of its *real nature*, just as little. It is evidently, however, not a *mere atrophy*. The extreme vascularity of the bones in the earlier stages of the affection, and the severe pain, render it probable that they are the seat of some exudation. That the urine is loaded with phosphate of lime, which in a case related by Mr. Solly formed a renal calculus, is an interesting and intelligible point in the history of this disease. No available *treatment* is known, beyond common measures for supporting the strength and allaying pain.*

SECTION III.—NEURALGIA IN BONE.

The bones, like other parts, are subject to that severe and continuous pain, which is known by the name neuralgia. The patients are generally women, the part affected the condyles of the femur, or the head of the tibia or humerus. The characters which distinguish neuralgic pain have been already briefly described (p. 19), and will be further treated of in the Chapter on Diseases of the Nerves.

SECTION IV.—INFLAMMATION AND SUPPURATION OF BONE AND PERIOSTEUM.

I. INFLAMMATION produces in bone the same changes that it does in the soft parts. In its slighter degrees it causes softening and swelling from enlargement of the channels which contain the blood-vessels, and from an opening out and greater porosity of the texture. This may be followed, in protracted chronic inflammations, by the filling up of the expanded channels of the enlarged bone, so that, instead of being enlarged and porous, it is enlarged and denser than natural. They who delight in hard words, may employ the term *osteoporosis* for the former, and *osteosclerosis* for the latter of these conditions. Severer degrees of inflammation may cause suppuration, softening, ulceration, and mortification. The enlargements produced by gout and rheumatism will be considered in the Chapter on the Joints, under the head of *Chronic Rheumatic Arthritis.*

II. ACUTE INFLAMMATION of bone most frequently attacks the femur or tibia in children, and is usually attributed to cold. It frequently affects more than one bone, but is generally confined to the shafts, and does not often extend through the epiphysial cartilage into the articular extremities.

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* See a remarkable case of softness of the bones, by Mr. H. Thompson, Med. Obs. and Injuries, vol. v. 1776 (the urine deposited a copious mortar-like sediment); Solly, Med. Chir. Trans. vol. xxvii.; Paget's Lectures, I. 135; Dr. Robt. Lee's Midwifery, p. 18; Rokitansky, vol. iii.; Wedl's Pathological Histology.

Symptoms.—The patient is seized with violent shivering and fever, and with deep-seated severe pain, and great swelling of the affected limb, the skin of which displays a kind of erysipelatous redness. Matter soon forms, burrows among the muscles, and at last points in one or several places. Sometimes the patient is destroyed by the violence of the constitutional derangement, or sinks under the profuse suppuration that follows; but more frequently life is preserved, and the bone left in a state of *necrosis*. On examination of cases that have proved fatal, or that have been subjected to amputation, the shaft of the bone is generally found separated from the epiphyses, and partially or entirely separated from its periosteum; and patches of newly-formed bone are deposited upon its surface, and between the layers of the periosteum.

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Treatment.—Aperient and febrifuge medicines, with leeches and fomentations, should be assiduously employed at first. So soon as fluctuation can be detected anywhere, an opening should be made; and it is better to do so too soon than too late. When a free exit is provided for the matter, a bandage should be applied to prevent its accumulation. If the patient seem likely to sink, in spite of tonics and nutriment, the limb must be amputated.

Diffused Abscess.— In some instances the medullary tube and cancelli of the bone are found filled with pus. This is apt to happen after amputation and compound fracture. Sometimes, however, it is induced by cold or bruises, without a wound. It may be suspected when an entire bone is necrosed, including its articular extremities, which usually escape in common inflammation, although the shaft perishes. The facility with which a communication can be established, between the cancellous structure, and the veins of an injured bone explains the frequency with which symptoms of blood-poisoning, and deposits of pus, and the other symptoms commonly attributed to phlebitis, are apt to occur after injuries of the skull and of other bones.—See *Pyæmia*.

III. CHRONIC INFLAMMATION of bone is most frequently the result of some constitutional disorder, and generally attacks several bones simultaneously. It is denoted by slow enlargement, tenderness, weight, and pain. If caused by injury, it may lead to necrosis; but in general it produces no organic change, save irregular enlargement.

Treatment.—The general health should be improved by change of air, alteratives, and tonics, especially Plummer's pill, or hyd. c. cretâ, in small doses at night, F. 63, 64, and the iodide of potassium, with sarsaparilla. Of the iodide of potassium, Mr. Stanley observes, that it never fails to assist in the removal of inflammation from bone, especially when the periosteum or medullary membrane is involved. He is in favour of small or moderate doses, such as gr. ii.—iii. thrice daily. F. 94, &c. The local measures are, repeated leechings and fomentations, so long as there is tenderness or much pain; with Scott's ointment, F. 160, or blisters or *iodine paint* subsequently.

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* Necrosis of the humerus.

IV. INFLAMMATION OF THE PERIOSTEUM (or PERIOSTITIS) generally occurs on the subcutaneous aspect of thinly-covered bones; especially the tibia, ulna, clavicles, and cranium. Its chief causes are, 1st, a *syphilitic* taint, in which case it produces oval swellings, called *nodes*, through an infiltration of lymph and serum into the periosteum, or between it and the bone. 2ndly. *Rheumatism*, especially in persons who have taken mercury to excess. 3rdly. *Scrofula*. In the two latter cases there is usually produced a swelling of the periosteum of the entire circumference of one or more bones. The scrofulous form attacks children, and is accompanied with remarkably little pain.

If acute or mismanaged, periostitis may lead to suppuration, and caries or exfoliation; but more frequently it causes merely a superficial deposit of bone, or an expansion of the surface of the bone. Periostitis occurring near a joint, is apt to involve the synovial membrane.

Treatment.—For the acute, leeches, fomentations, purgatives, Dover's powder at bed-time, and colchicum in doses of ♏ xx. of the wine every six hours; or gr. iii. of the iodide of potassium at the same interval. If the case be of syphilitic character, it may be expedient to administer mercury, when the acute symptoms are passing off. For the chronic, the same treatment as for chronic inflammation of bone. The severe nightly pain is, after the application of leeches, best relieved by renewed blisters. An incision is sometimes necessary if there is a collection of fluid between the periosteum and bone, and no measures succeed in producing its absorption and allaying the pain; but it very often happens, especially in venereal cases, that mercury (if not previously administered to excess), or the iodide of potassium, sarsaparilla, and blisters, will accomplish those objects. If not, subcutaneous incision, effected by passing a long narrow blade under the skin for the distance of an inch or two into the swelling, may succeed in relieving pain and tension, and disengorging the distended blood-vessels, after all other remedies have failed. The scrofulous form admits of only palliative and constitutional treatment.

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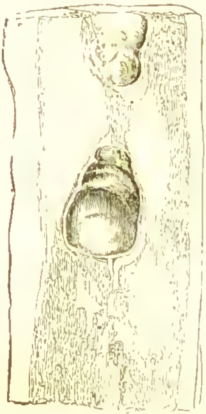

V. Abscess is a rare consequence of inflammation of the bone. A cavity lined with a vascular membrane, and filled with pus, is formed in the substance of a bone, generally the tibia, which may or may not be unusually dense around it. There may possibly be a small piece of necrosed bone confined in the cavity, or the disease may have begun from a deposit of tubercle. Abscess may be suspected when, in addition to permanent inflammatory enlargement and tenderness (which may have lasted for years), there is a fixed tensive pain at one particular spot, aggravated at night, and unrelieved by any remedy, though perhaps it may have occasional remissions. The two affections that are most likely to be confounded with it are neuralgia and chronic inflammation.

Treatment.—When there is good reason to suspect the existence of abscess, the bone must be laid bare by an X or H incision, and an opening be made with a trephine at the precise seat of the pain. Mr. H. Lee recommends the trephine to be very small, as then more than one perforation can be made, if needful; and he has shown that this operation may be resorted to with benefit; not only in cases of abscess, but in many others, in which the bone is extremely condensed, and its interior contains the residue of previous effusion. After the pus is evacuated, the wound must be left to granulate and cicatrize.†

SECTION V.—NECROSIS AND EXFOLIATION.

The term necrosis, although signifying the death or mortification of bone generally, is yet usually restricted to one form, in which part of the shaft of a cylindrical bone dies, directly from injury, or else from violent inflammation, and is enclosed in a case of new bone. The term *exfoliation* signifies necrosis of a thin superficial layer, which is not encased in any shell of new bone.

I. Necrosis is a frequent consequence of inflammation of the shafts of long bones in children, especially of the femur and tibia. It more frequently attacks bones or parts of bones of compact tissue, than of spongy. Yet sometimes a small portion of the cancellous tissue in the centre of the head of a long bone becomes necrosed, with great detriment to the neighbouring joint. Necrosis of the lower jaw from the fumes of lucifer matches, will be noticed in the Chapter on Diseases of the Face and Mouth.

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* Circumscribed abscess in bone.

† Sir B. Brodie's Lecture, Med. Gaz., Dec. 1845. Lee's Pathological and Surgical Essays, 1854, p. 44.

Pathology.—The bone dies; but its periosteum and the surrounding cellular tissue, if healthy, together with the articular extremities of the bone, and its medullary membrane —any contiguous healthy parts in fact—effuse lymph, which speedily ossifies, forming a new shell around the dead portion, and adhering to the living bone above and below it. The dead portion (technically called the *sequestrum*) generally consists of the circumference of the shaft only, and not of the entire thickness; for the interior of the shaft seems to be atrophied and absorbed after the death of the exterior. The inside of the sequestrum is usually rough, as if worm-eaten. In the majority of cases the *epiphyses*, or articular extremities, are fortunately unaffected. After a time, if the *sequestrum* is removed by art or accident, the newly-formed shell contracts, its cavity is abolished, and it gradually assumes the shape and function of the former bone.

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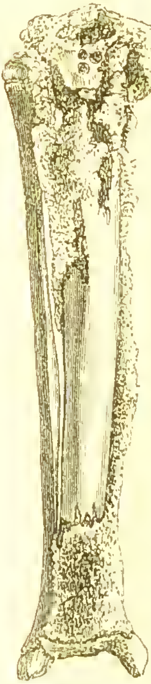

Symptoms of Necrosis.—After acute inflammation, the bone remains permanently swelled; and the apertures which were made for the discharge of matter, remain as sinuses, from which many sensitive, irritable granulations shoot. These sinuous apertures in the skin correspond to holes in the shell of new bone (technically called *cloacæ*);—and if a probe be passed into them, the *sequestrum* may be felt loose in the interior; or at least the probe will strike against dead bone.

Treatment.—The indication is to remove the *sequestrum.* Any hope of its being absorbed or extruded by any natural process, is quite nugatory; and to permit it to remain, is but to condemn the patient to a perpetuance of disease and deformity. So soon, therefore, as the shell of new bone is sufficiently strong, and the old sufficiently loose, the latter should be removed. If small, it may perhaps be grasped and removed without difficulty; if larger, an operation will be necessary. A free incision should be made so as to expose the surface of the bone, and it should be made at a part where *cloacæ* exist, or where the bone is nearest the skin. Then the new shell must be perforated with the trephine, or with Hey's saw; or the cloacæ may be enlarged with bone forceps, or with a chisel or gouge; —and the sequestrum must be drawn out. If it cannot be extracted entire, it should be divided with strong forceps, and each portion be

* Necrosis of shaft of tibia; partial formation of new bone; following upon previous caries of the head of the bone. From St. Mary's Hospital Museum.

extracted separately. If the sequestrum cannot easily be extracted, the wound should be plugged with lint, which will tend to enlarge the cloacæ. Mr. Stanley directs that as little as possible of the new bony shell should be removed, because it might not be replaced, and the bone be left too weak to be useful. Necrosis of the articular extremities of bones, or of the tarsus or carpus, often causes irreparable disease of the neighbouring joints, and requires excision or amputation. Yet, even here, conservatism should prevail, if possible; and free incisions for the discharge of pus and debris, and for the extraction of dead or carious portions of bone should be resorted to, before a part is condemned.

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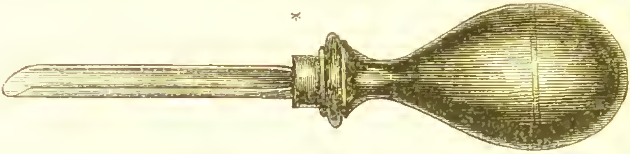

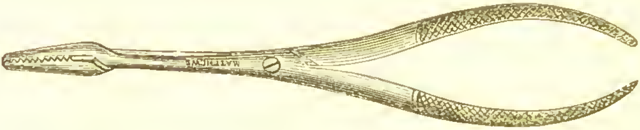

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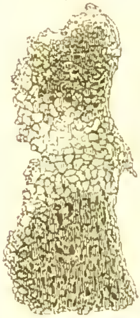

II. Exfoliation signifies the mortification and separation of a superficial layer of bone, or of the extremity of a bone—of a phalanx, for example, or of the end of a bone after amputation—without the formation of a shell of new bone, as in necrosis. It is generally caused by some mechanical or chemical injury, or by stripping off the periosteum. Not, however, that stripping off the periosteum is invariably followed by exfoliation; for the bone may remain red and moist, and throw out granulations; whereas, if it be about to exfoliate, it becomes white and dry.

Treatment.—A lotion of weak nitric acid may be useful; and the exfoliating portion should be removed as soon as it can be detached.

SECTION VI.—CARIES.

Caries is an unhealthy inflammation, through which the cavities of bone become the seat of various exudations, which interfere with the vitality of the bone substance, and cause it to be absorbed, or else to ulcerate. On examination the bone is soft and red; its cells are filled with a red serous or thick glairy fluid, or with soft granulations. In scrofulous cases there may be a deposit of tubercle, which causes wasting of the bone structure around, and which undergoes the same series of changes that it does when deposited in the lungs or glands.—(See p. 87.) After a time suppuration occurs; an abscess breaks, and the carious portion of the bone, already softened and spongy, gradually perishes in minute scales, which are thrown off and discharged with the pus. The bone when macerated and dried, looks soft and spongy; eaten into hollows, and thrown into irregular elevations; the latter marking the site of granulations, and of attempts at reparation.

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* The upper shows a gouge; the lower a useful form of forceps for seizing and extracting the sequestrum.

† This cut shows the extremity of the phalanx in the act of separation by exfoliation. At the part where the separation is to occur, the cancelli are seen to be enlarged, so as to form a kind of *diploë*, and their walls are thin.

Symptoms.—"The external character of the limb," says Mayo, "is the same in necrosis and caries. The bone appears enlarged, and one or more sinuses open from it at points that are soft, and red, and sunken." If a probe is passed into these, it will readily break down the softened texture of the carious bone, which yields a gritty feel.

Causes.—Caries most frequently attacks bones of a soft, spongy texture; such as the vertebræ, the round and flat bones, and the articular extremities of long bones. Its genuine cause is some constitutional disorder, scrofula, syphilis, or mercury.

Treatment.—The indications are twofold; —to rectify constitutional disorder, and to remove the local disease. The former object must be accomplished by change of air, tonics, and alteratives, and the measures that have been directed for scrofula, or for tertiary syphilis, supposing the caries to be connected with either of those maladies.

If it can be done, the best local remedy consists in freely exposing and removing the whole of the diseased portion of bone by the saw, or gouge, or trephine. If this cannot be done, lotions of the dilute nitric or phosphoric acid may be tried.

SECTION VII.—TUMOURS IN BONE.

We have already described the various enlargements of bone, which depend on hypertrophy and inflammation. Besides these, bone is liable to every variety of tumour, and especially to enchondroma, and the fibrous, and fibroplastic, which may respectively be developed on its surface, or within its substance. We must refer to the Chapter on Tumours for a description of these growths in general; and to that on the Jaws, for further researches on their special characters. Besides these, the following tumours require notice:—

I. TUMOURS FROM EXTRAVASATED BLOOD.—Mr. Travers[*] describes a case in which, after a blow, the clavicle enlarged into a firm, oval, elastic tumour; which, when punctured by a grooved needle, yielded a few drops of dark grumous blood. The whole bone was extirpated. On examination, it was proved that the tumour had evidently originated in a rupture of the vessels of the bone, and an extravasation of blood into the cancelli. By the pressure of this blood, and a continuance of the extravasation, the bony tissue was expanded and absorbed; and the cancelli were converted into chambers filled with dark solid coagula. The tumour was invested by the periosteum. The *cephalhæmatoma* of newly-born children is a state depending on effusion of blood within and around the bones of the head.

II. PULSATING TUMOURS are sometimes developed in bone, and may be of three kinds. 1st. Soft cancer, the circulation through which may be so energetic, that the tumour pulsates, and yields a whizzing sound like that heard in aneurisms. 2ndly. Tumours formed by the development of *erectile tissue* in the substance of a bone: and, 3rdly. Tumours depending on enlargement of the osseous arteries.[†] To the last, the name of *osteo-aneurism* is given. The seat of the tumour is generally the extremity of one of the long bones, and frequently the tibia just below the knee. The patient complains of a sudden pain in the part. This is followed by painful swelling, and all the veins of the leg are observed to be very tense and full. After a time, the whole limb becomes dark red, and painful; and the tumour becomes distinctly pulsatory. It is generally moderately firm to the touch, and perhaps gives a slight crackling sensation, owing to the thin shell of bone covering some part of it. On examination it is found to be composed of a spongy tissue, containing convoluted vessels and cells, the latter filled with clots of blood in concentric layers: the bone of course expanded, thinned, and absorbed. This disease has also been observed in the humerus, radius, femur, and ilium. Ligature of the main arterial trunk of the limb, or amputation, is the only remedy.

III. SIMPLE SEROUS OF SYNOVIAL CYSTS, and those containing hydatids, are occasionally developed in bone; causing it to form a tumour, the diagnosis of which must be exceedingly difficult, until the part has been laid open by operation. Mr. Keate treated a case successfully by removing as much as possible of the cysts, and of the bone containing them, and applying a solution of sulphate of copper to the diseased surface.[‡]

IV. CANCER appears to have a peculiar predilection for the bones;

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[*] Med. Chir. Trans. vol. xxi.

[†] Stanley, Med. Chir. Trans. vol. xxviii.; Breschet, *Sur des Tumeurs Sanguines.*

[‡] Vide Mr. Keate's case, Med. Chir. Trans. vol. x.: quoted also in Mayo's Pathology; case of hydatids growing on the tibia and causing absorption of the bone and fracture, in Wickham on Diseases of Joints. See also Med. Gaz. vol. xxx. p. 990. Rokitansky, vol. iii.

since not only are they the frequent seat of primary cancer, especially of soft cancer in early life, but they also frequently suffer from secondary deposits, especially during the progress of cancer of the breast. In many cases, too, the entire skeleton suffers a remarkable atrophy, all the bones becoming thin, light, and breaking from muscular exertion, or from the slightest violence. The bones most frequently affected with primary cancer, are the upper jaw, lower end of the femur, and upper end of the tibia.

Cancer differs somewhat in its progress, according as it is deposited in the interior or on the exterior of bone. In the former case it is usually found in circumscribed masses, which, as they increase, cause entire atrophy of the bone around, and reduce it to the thinnest possible shell, so that it breaks. When the cancer, on the contrary, is developed on the exterior, it causes considerable hypertrophy of the periosteum, and the surface of the bone sends out stalactitic branches into the tumour, just as it does when an enchondroma, or fibrous tumour, has a similar situation. It must be noticed that this ossification of the fibrous septa of a cancerous tumour does not constitute an *osteoid cancer*. Vide p. 113.

Of the symptoms, diagnosis, and treatment, we need not speak again here, except to say that the question of amputation or extirpation must be decided by the rules given at p. 116.

SECTION VIII.—FRACTURE GENERALLY.

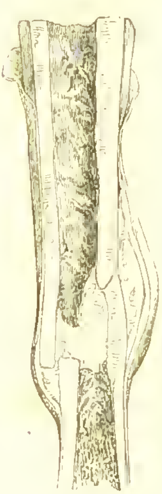
The term *fracture*, with its varieties, simple and compound, transverse, oblique, and comminuted, requires no definition.

Exciting Causes.—The exciting causes of fracture are two; mechanical violence and muscular action. Mechanical violence may be *direct* or *indirect*. It is said to be *direct*, when it produces a fracture at the part to which it is actually applied; as in the instance of fracture of the skull from a violent blow. It is said to be *indirect*, when a force is applied to two parts of a bone, which gives way between. This is exemplified in the case of fracture of the clavicle from a fall on the shoulder. The sternal end of the bone is impelled by the weight of the body, and the acromial end by the object it falls against; and the bone, acted upon by these two forces, gives way in the middle. Sometimes fracture is partial (*green-stick fracture*), part of the fibres only breaking, and the rest bending.

The bones most commonly fractured by muscular action are the patella and olecranon; but the humerus, femur, or any other bone may give way from this cause, if preternaturally weak.

Predisposing Causes.—There are certain circumstances which render the bones more liable than usual to be broken. These are, 1. The atrophy arising from old age, or from prolonged disuse of any limb. 2. Certain diseases, as *mollities ossium* and *cancer*. 3. *Original conformation*; the bones of some people being exceedingly brittle, without any assignable cause.

Repair.—The first few days after fracture is a period of repose; little or no change taking place, except, perhaps, the effusion of small quantities of lymph and serum, and the absorption of blood that may have been extravasated. To this follows a period of exudation, in which plastic lymph is effused between, possibly around, the broken ends. To this follows a period of development, in which the lymph is converted first into fibrous tissue, and then into bone, or first into cartilage, and then into bone. The time which elapses before union is completed may vary from four to ten weeks; being so much the less, in proportion as the patient is younger and healthier, and especially if the fracture is nicely adjusted, and kept at perfect rest. The material which unites a fractured bone fills up the medullary cavities, and renders the part quite solid at the seat of injury. The last stage in the process of repair consists in the absorption of superfluous bone, and the restoration of the medullary cavities. This may be completed in from six to twelve months.



The material by which fractures were consolidated was called, in old surgical works, *callus*. If the broken ends are accurately adjusted together, it is simply deposited between them, with very slight infiltration of the periosteum, and slight, if any, projection of *callus*.

If the ends are not accurately adjusted, the callus fills up any angular interspaces, as shown in the adjacent cut.

This cut also exhibits the formation of what is called a *provisional callus*, that is to say, a ferrule of new bone encircling both fragments for some little distance above and below, so as to splice them together firmly, before they are actually united by a *permanent callus*. It was formerly taught, that this is the regular mode in which the union of broken shafts of long bones is accomplished. But later researches have shown, that the doctrine of formation of provisional callus is generally true only in the case of animals, in whom it depends on the constant movement and disturbance to which their bones when broken are subjected; and in the human subject it is generally true only as regards the ribs, which are bones almost in perpetual motion.*

The source from which callus was exuded, was very much disputed in the last generation. Doubtless in the most favourable cases, of simple fracture nicely adjusted, and uncomplicated by inflammation, it proceeds from the vessels of the bone only. Yet the periosteum, and not only so, but any neighbouring tissue, is also capable of exuding a lymph which will ossify; nay, if the greater part of the shaft of a bone be removed or necrosed, the lymph yielded by these parts, and especially by the periosteum if partly preserved, may be converted into a new bone.

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* See Mr. Lawson's case of Provisional Callus in neglected Fracture of the Femur in a child: Med. Times, 19th Feb. 1859.

Bones that do not unite.—The neck of the thigh bone, the olecranon, patella, and other bones invested with synovial membrane, do not reunite readily by bone. For this there are three reasons. First, there is great difficulty in keeping the broken surfaces absolutely in contact, and secondly, at perfect rest; and thirdly, there is no vascular periosteum to form a provisional callus. Moreover, if portions of the skull be removed, the gap is not filled up.†

SYMPTOMS.—The symptoms of fracture are three: 1. *Deformity;* such as bending, or shortening, or twisting of the injured limb. This is judged of by the eye. 2. *Preternatural mobility.* This is ascertained by the surgeon, who firmly but gently grasps the upper end of the broken bone, and moves the lower, so as to see if one end moves independently of the other; or if any part yields on pressure. 3. *Crepitus;* a grating noise heard and felt both by patient and surgeon when the broken ends are rubbed against each other. If the broken parts are displaced, they must be drawn into their natural position, otherwise no crepitus will be detected. In addition to these symptoms, there will be more or less pain, swelling, and helplessness of the injured part, startings and spasms of the muscles, and considerable subcutaneous ecchymosis.

The causes which produce displacement after fracture are three. 1. *Muscular action,* which produces various degrees of bending, shortening, or twisting, in different cases. 2. The weight of the parts below, which, for instance, causes the shoulder to sink downwards when the clavicle is broken. 3. The original violence which caused the fracture, as when the ossa nasi are driven in.

TREATMENT.—The general indications for the treatment of fracture are, to place the fragments in their natural position; and, having done so, to maintain them in perfect contact and at perfect rest till they have firmly united.

The first thing required in fractures of the lower extremities is to carry the patient to his home, or to an hospital, gently, on a litter, with both legs tied securely together at the knee and ankle, so that there may be no chance of the broken bone being thrust through the skin. A litter may be made of a couple of poles, and a sack or horsecloth. Then the bed on which the patient is to lie should be made as firm and level as possible. The patient is to be gently laid on it, undressed, and examined. Before putting on any apparatus, a good washing will be of use. Next, the limb must, if possible, be put in a position that will relax the principal muscles that cause displacement.

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[*] Fractured tibia and fibula after seven years; large callus and irregular ossification. St. Mary's Museum.

[†] See Paget's Lectures and Mayo's Pathology

Secondly, the fracture must be *reduced* or *set;* that is to say, the broken parts must be adjusted in their natural positions. For this purpose, the upper end of the limb must be held steadily by one assistant, while the lower is *extended*, or firmly, but gradually and gently drawn in such a direction as to restore the limb to its proper length and shape; the surgeon, meanwhile, by manipulation with his fingers, placing the fragments in their correct position. Chloroform should be administered to prevent pain and spasm.

Thirdly, it is usual to bandage the whole of the fractured limb from its extremity. This is done for the double purpose of preventing swelling, and of confining the muscles, that they may not contract and disturb the fracture.

Fourthly, it is necessary to use some mechanical contrivances to keep the limb of its natural length and shape, and prevent any motion at the fractured part. It is usual to employ for this purpose *splints* of wood, carved to the shape of the limb. But every surgeon ought to be able to construct splints out of such materials as the carpenter's shop affords. The surgeon should measure with a tape the sound limb which corresponds to the injured one, and choose splints that are long enough to rest against the condyles or other projecting points at its extremities.

These must be *padded;* and pads are easily made of tow or horsehair, well shaken or pulled out, and wrapped up in pieces of old linen. But the very best pads are made of old blankets, which should be cut into strips long and wide enough to line the splints; and a sufficient number of strips should be laid on, to give the requisite softness, and they may be arranged so as to press, or not to press, exactly where the surgeon desires it. The splints, when ready, should be firmly bound to the limb with pieces of old bandage or linen straps and buckles; and when they are properly put on, so as to keep the broken part immoveable, and prevent muscular spasms, without being too tight, the patient is sure to express himself as unspeakably comforted. Instead of wooden splints, it is sufficient in some cases to use pasteboard softened in boiling water, so that it may be accurately adapted, and then allowed to dry and stiffen.

But one of the greatest improvements in the mechanical treatment of fracture, especially of the leg, is the *starched* or *gummed bandage.* This is composed of layers of lint or old linen or of bandages soaked in thick mucilage of starch or dextrine, or of a mixture of equal parts of powdered gum arabic and precipitated chalk. These, when dry, form a remarkably light but firm support. A dry bandage should be put on first of all; then layers of wadding to fill up all hollows; then layers of bandages well soaked in starch.

But how is the starched bandage to be got off, or loosened, if too tight? In order to provide for this, a strip of stout tape should be laid lengthwise on the limb before the starched bandage is put on. By lifting up one end of this, the blunt point of a pair of scissors may be got under the bandage without wounding the skin; so that the starched bandage can be ripped up and taken off, as a complete mould; then, if damped with boiling water, it can be softened, and put on again more comfortably.

Splints may also be made of gutta-percha, softened in boiling water, moulded to the shape of the limb, and then trimmed with scissors, and hardened by cold water. Or of wire gauze, perforated zinc, and a hundred other substances, of which perhaps paper cut into strips, soaked in paste, and laid on in layers, is one of the most convenient.

We think it right also to mention the *straw splints*, made by filling a linen bag, of the size of the splint required, with unbroken wheat straw, such as is used in thatching, the straw being cut to the length of the limb, and the open end of the bag then sewn up. This is both splint and pad in one, and may often be of great service in country and military practice.*

The remaining treatment of simple fracture must be conducted on general principles. Cordials, to restore the patient from the shock of the injury; the catheter, if he cannot make water, which is common after fractures of the leg; aperients, if necessary; cold lotion, if agreeable; and leeches, very rarely, to allay excessive inflammation, must be employed at the discretion of the practitioner. But of all remedies for allaying pain and irritation, preventing spasms and starting and displacement of the bones, and enabling the patient to bear tranquilly the penance of long confinement to bed, nothing equals opium, in grain doses, once, twice, or thrice a day; given without the patient's knowledge, and mingled, if need be, with colocynth, to prevent constipation.

The apparatus and bandages must, if necessary, be loosened when swelling comes on, and be afterwards tightened sufficiently to keep the parts steadily in their place; and care must be taken to prevent painful pressure on any particular spot, and to rectify any displacement as soon as it may occur.

If the fingers or toes become blue or benumbed, the surgeon should remember the possibility of gangrene from too tight a bandage.

If, through mismanagement, a fracture has united crookedly, the patient should be narcotized by chloroform, and the uniting or united part be bent, or even broken, if necessary, so as to restore the right shape. Such a proceeding may easily be effected before the fourth week, and the author knows cases in which it was done successfully after many months.

HABITUAL DEFORMITY must not be confounded with fracture or dislocation. When a person who has met with a fall, or other accident, is found to have a limb shortened or misshapen, the surgeon should always ask whether or not there was any deformity before the accident, else he may fall into the ridiculous error of treating an old deformity as if it were a recent injury.

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* See some remarks by Mr. Tuffnell, in Ranking's Abstract, vol. iii. p. 240.

SECTION IX.—NON-UNION AND FALSE JOINT.

There are some cases in which fracture of the shafts of bones does not unite by bone. This is liable to happen:—

1st. If the fractured part is subjected to frequent motion and disturbance; in which case the effused lymph, instead of ossifying, will either be converted into bands of fibrous tissue, uniting the broken ends, or else a *false joint* will be formed; the ends of the bones being covered with synovial membrane, and surrounded with a ligamentous capsule.

2ndly. The reparative processes may be deficient if the vital powers are exhausted by age and debility; or if the system is under the influence of gout, syphilis, or cancer; or if an acute disease or fever comes on; or if the part be deprived of its nervous influence. Thus Mr. Travers relates a case in which a patient had a fracture of the arm, and of the leg, and likewise an injury of the back, which palsied the lower extremities. The arm united readily enough, but the leg did not. In some cases of women, pregnant or suckling, broken bones have not united, but they more frequently do so. But yet there are some cases which it is as difficult to account for as it is to remedy.

TREATMENT.—There are three indications: 1st. To bind up the part in splints, or the starched bandages, or to envelop it in a mould of plaster of Paris, so as to insure perfect rest, perfect apposition, and pressure of the broken ends against each other. But, as Sir B. Brodie very justly observes, the bandage should not be put on so tightly as to impede the general circulation of the limb.

2ndly. Should this not succeed, after a fair trial of six weeks or two months, means must be adopted to excite the adhesive inflammation around the fracture. This may be done by rubbing one end of the bone roughly against the other, and breaking up any fibrous bands, and then splints should be again firmly applied for a month. If this also fail, some operation must be resorted to. 1. The surgeon may cut down on the fracture, by the *subcutaneous method*, and scarify the ends of the bones by a long narrow knife; or he may pass in a probe, or iron wire, between the broken extremities, and allow it to remain a week or ten days, after which the limb should be put up immovably in splints. 2. The fracture may be cut down upon, and one or both of the broken ends be drilled with holes, into which ivory pegs are to be firmly driven, and allowed to remain for some weeks. 3. A seton may be passed through the limb, between the fractured ends, or through the flesh close to the fracture. 4. If other measures also fail, the last resource is to cut down on the fracture, and saw or shave off the ends of the bone (sometimes it is found that a little piece of muscle is wedged between them, which must be removed); but these operations are of a most severe and dangerous character, and not to be resorted to without absolute necessity.

3rdly. Care should be taken to detect and remedy any constitutional disorder to which the want of union can be attributed. Debility must be counteracted by tonics, nutritive food, and stimulants. Mr. Fergusson relates a case of fractured thigh, in which no callus was formed for three weeks, until the patient was allowed a reasonable quantity of whiskey, to which he had been previously accustomed; and Sir B. Brodie relates similar instances. It will be worth while to administer *lime* plentifully in the form of liquor calcis with sarsaparilla, F. 84; or two ounces of lime-water may be given thrice a day, with an equal quantity of milk; or, which is better, the *phosphate of lime*, as recommended by the author, F. 201. Mercury may be given if there is a syphilitic taint; and Mr. B. Cooper gives a case of non-union in which, although the general health appeared perfectly good, mercury given to ptyalism effected a cure after the seton had failed.*

A few instances are known in which the callus, after union was completed, inflamed and became absorbed, so that the fracture was disunited again. Leeches and blisters to the part proved effectual remedies.† A recent callus is also sometimes absorbed during fever; and this occurrence used to be common enough in the sea-scurvy.

SECTION X.—COMPOUND FRACTURE.

DEFINITION.—A fracture with a wound, which communicates with the fractured part.

CAUSES.—Fracture may be rendered compound. 1. By the same injury which broke the bone. 2. By the bone being thrust through the skin. 3. By subsequent ulceration or sloughing of the integuments.

DANGERS.—These are threefold. 1. The shock and collapse of the injury, which may prove fatal in a few hours, especially if much blood has been lost. 2. Inflammation, fever, and tetanus. 3. Hectic or typhoid fever from excessive suppuration.

QUESTION OF AMPUTATION.—In order to decide upon the necessity of this operation, the extent of the injury and the restorative powers of the patient must be most carefully examined. If the bone is very much shattered and comminuted; if the soft parts are extensively torn or bruised; if the large vessels or nerves are injured; if, in particular, the skin has been torn away, so that the wound cannot be closed; or if it is so injured that a large tract of it must slough; if the patient is very old, or much enfeebled, either by previous disease, or present loss of blood; if the collapse of the injury is excessive and permanent—amputation is probably requisite. See Gunshot Wounds, p. 148.

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* Vide Sir A. Cooper on Dislocations and Fractures, p. 568; Brodie in Med. Gaz. vol. xiii.; and cases by Kennett, Hill, Stanley, Bowman, Fergusson, Hilton Geohegan, Square, and others, in Ranking's Abstract, vols. x. xiv. and xvi.

† James, Address in Prov. Med. Trans. 1840.

Compound Fractures of Joints, and especially of the upper extremity, should be treated by excision of the injured part, if the great blood-vessels are not injured.

Laceration of Arteries is a dangerous complication both of simple and compound fracture. It is detected by the great flow of blood, if there be a wound; and if not, by a rapid, diffused, and dark-coloured tumefaction of the limb, with coldness and want of arterial pulsation in the parts below. If it be the *femoral*, amputation will most probably be required, because the vein may have been injured also; if any other (the anterior or posterior tibial, for instance), it may be secured; provided that there is no other valid cause for amputation, and that the required incision will not too much aggravate the injury to the soft parts. But, *cæteris paribus*, this accident is always an additional reason for amputation, if there be other circumstances rendering it probably expedient.

Treatment.—If it be determined to save the limb, it must first be placed in a proper position, and then the fracture must be reduced. If a sharp end of bone protrude, and it cannot easily be returned or kept in its place, it should be sawn off. Any loose fragments or splinters of bone should be at once removed; and, if necessary, the wound may be dilated for this purpose. If suffered to remain, they greatly aggravate the inflammation and danger of tetanus, and may produce long-continued disease of the bone. After reduction, the great object is to close the wound as nicely as possible, so as to heal it up, and to convert the compound fracture into a simple one, and the best application is a piece of lint dipped in blood, or in compound tincture of benzoin; then bandages and splints are to be used. If necessary, the splints should have apertures corresponding to the wound, so that it may be dressed without disturbance to the whole limb. When swelling comes on, the bandages must be loosened, and cold be applied if agreeable. Pain and restlessness must be relieved by full doses of opium; thirst, by saline draughts, F. 58; and the bowels be opened, if necessary, and if it can be done without disturbance. The catheter should be used, if required. But perhaps reaction is not fully established.—"We notice irregular action of the heart; the pulse does not rise as it should do; in the state of sympathetic fever the artery is left subdilated, weak, and its beats are fluttering and uncertain; the tongue is coated to a certain degree; the expression of the countenance agitated, and unsteady in its direction; and the sensorium seems faltering in its powers. The patient does not clearly understand his real state, and usually declares that he feels well; he does not sleep much, and is wandering when he does. The wound is dry, and the parts about it assume an ashen colour, with the feel of puffiness in the parts about it."* For this condition brandy and beef-tea are the remedies. The great object in the subsequent treatment is to prevent the lodgment of matter, by sponging and pressing it out carefully at each dressing, syringing with weak zinc lotion, and applying compresses to prevent its accumulation, and, if required, by making openings for its discharge. But if, notwithstanding the employment of tonics, wine, and good diet, the patient seems likely to sink under the discharge and irritation, amputation is the last resource.

SECTION XI.—PARTICULAR FRACTURES.

I. FRACTURES OF THE OSSA NASI, AND OF THE MALAR AND SUPERIOR MAXILLARY BONES, may be produced by violent blows or falls on the face, or by gunshot injuries.

Treatment.—Any displacement of the fractured portions should be rectified as soon as possible, by passing a strong probe or female catheter up the nostril, and by manipulation with the fingers. A depressed fragment may often be conveniently raised by passing one blade of a dressing forceps up the nostril, and applying the other externally, so as to grasp the fragment between them. Some practitioners are in the habit of introducing tubes or plugs of oiled lint, in order to keep the fragments in their places; but this appears to be unnecessary, and is very irritating. A plug of lint may, however, be requisite to check profuse hæmorrhage. If the fracture is compound, any *loose* splinters should be carefully removed. The great swelling, ecchymosis, bleeding from the nose, and headache, with which this injury is followed, will require to be combated by bleeding or leeches, purgatives and cold lotions, and spoon diet; and if collections of matter form, they should be opened without delay. If there are symptoms of pressure on the brain, and the vomer seems depressed, it should be carefully drawn forwards, if possible.

II. FRACTURE OF THE LOWER JAW may be caused by violent blows. Its most usual situation, says Mr. Vincent, is close to one of the eye-teeth. Sometimes in children (though rarely) it occurs at the symphysis, and still more rarely at the angle, or in the ascending ramus.

Symptoms.—It is known by pain, swelling, and inability to move the jaw, and irregularity of the teeth, because the anterior fragment is generally drawn downwards by the muscles arising from the hyoid bone, whilst the posterior fragment is fixed by the temporal. On moving the chin, whilst the hand is placed on the posterior fragment, crepitus will be felt; and the gums are lacerated and bleeding. The diagnosis of fracture of the *ascending ramus* will often be obscured by the great swelling. Great pain and difficulty of motion and obscure crepitus are the chief signs.

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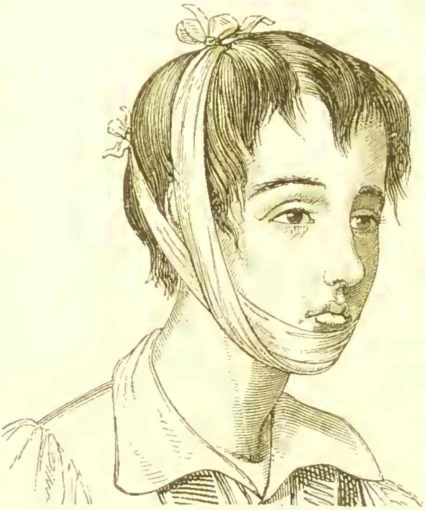
* Vincent, op. cit. p. 127.

Treatment.—A piece of pasteboard, or gutta percha, softened in boiling water, should be accurately fitted to the jaw, and then a four-tailed bandage should be applied. This is made by taking a yard and a half of wide roller, and tearing each end longitudinally, so as to leave about eight inches in the middle, which should have a short slit in it. The chin is to be put into this slit, and then two of the tails are to be tied over the crown of the head, so as to fix the lower jaw against the upper, and the other two are to be fastened behind the head. It is useful to place a thin wedge-shaped piece of cork between the molar teeth on each side, especially if any of the teeth at the fractured part are deficient, in order to insure more perfect adaptation, and to keep the incisor teeth a little apart. Sometimes a tooth falls down between the broken parts; a circumstance which should be looked to, if there is much difficulty in fitting them together.



The patient for the first fortnight must be fed entirely with broth, gruel, bread-pap, &c. The cure generally occupies five or six weeks.

III. FRACTURE OF THE CLAVICLE is most frequently *situated* at the middle of the bone, and is generally *caused* by falls on the arm or shoulder; sometimes, however, by direct violence, when it is generally situated near the acromial extremity. When fracture of the acromial end of this bone is situated between the coraco-acromial ligaments, there is very little displacement; but when the fracture is external to these ligaments, the acromial extremity of the bone is apt to turn round at right angles to the sternal portion.*

Symptoms.—The patient complains of inability to lift the affected arm, and supports it at the elbow; the shoulder sinks *downwards, forwards,* and *inwards;* the distance from the acromion to the sternum is less than it is on the sound side;—and the end of the *sternal* fragment of the bone projects as though it were displaced, although it is not so in reality, but merely appears to be so, in consequence of the sinking of the shoulder and of the outer fragment.

Treatment.—The shoulder must be raised, and must be supported in a direction *upwards*, *backwards*, and *outwards*. The broken parts may be *reduced*, either by putting the knee between the scapulæ and drawing the shoulders backwards; or by placing the elbow close to the trunk and a little forwards, and then pushing it upwards. To support the parts during the cure, the most common apparatus is—

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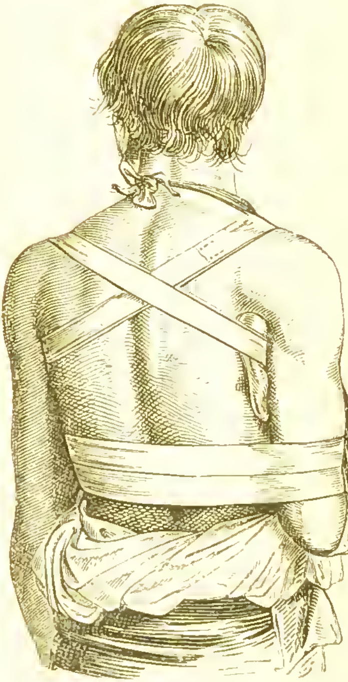
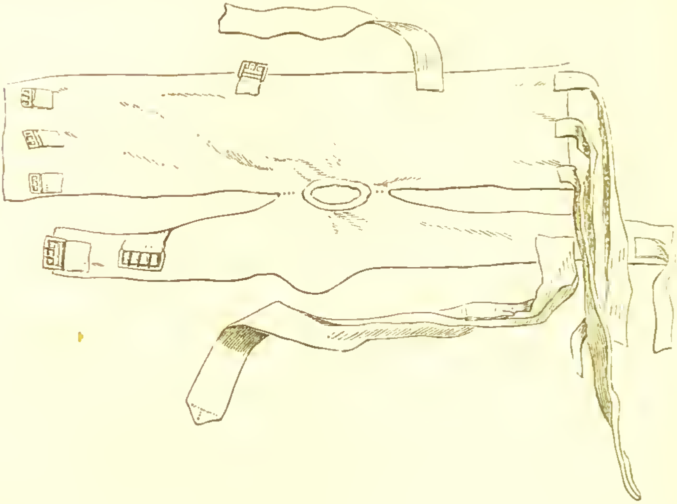
* A Treatise on Fractures in the vicinity of Joints, by Robert William Smith, M.D. &c. Dublin, 1847. A most complete and masterly work.

The *stellate*, or *figure-of-8 bandage*, represented in the cut. In the first place a thick wedge-shaped pad must be put into the axilla, with the large end uppermost. Then a long roller must be passed over each shoulder alternately, and be made to cross on the back. In the next place, the arm must be confined to the side by two or three turns of the roller; and lastly, the elbow should be well raised by a sling, which is also to support the forearm. It will be noticed, that the shoulder is kept *up* by the sling, *out* by the pad, and *back* by the bandage. The same objects may be gained by means of three handkerchiefs, one to act as the pad in the axilla; another for a sling; and the third to keep the arm close to the body—the whole being stitched together.



Another simple contrivance, invented by Mr. James Duncan for the same purpose, is a strip of *jean* about a yard long, of the shape represented in the next figure (p. 238). The elbow is fixed in the hole; the smaller straps pass back and front of the chest, and are buckled over the opposite shoulder; and the broad part is buckled round the chest, confining the arm to the side. The whole being in one piece cannot slip, and is very available for children. In ordinary cases the patient may be allowed to walk about in a week or ten days, and the cure will be completed in a month or five weeks. The patient should be informed that some little irregularity is apt to remain. If, however, there is any difficulty in maintaining a proper position, the patient must be confined to bed, and some additional apparatus be employed. The simplest is a straight splint across the shoulders, to which they are to be bound by the figure-of-8 bandage; or a splint shaped like a T, of which the horizontal part is bound to the shoulders; and the vertical part passes down the back, and is confined by a belt round the abdomen.



Besides these there is the *clavicle bandage*, which consists of two loops for the shoulders, attached to two pads resting on the scapulæ, which are drawn together by straps and buckles.*

IV. FRACTURES OF THE SCAPULA.—The *body* of this bone may be broken across by great *direct* violence. One case is known also in which it was fractured by muscular action.† The symptoms are, great pain in moving the shoulder, and *crepitus;* which may be detected by placing one hand on the acromion or spinous process, and moving the shoulder or the inferior angle with the other.

Treatment.—A roller must be passed round the trunk, and a few turns be made round the humerus, so as to fix the arm to the side, and prevent all motion. Opium, and quietude, perhaps purging and low diet, will be required to avert inflammation of the chest.

FRACTURE OF THE NECK OF THE SCAPULA, by which is meant an oblique fracture, detaching the coracoid process and glenoid cavity from the rest of the bone, is a rare accident, insomuch that some surgeons have doubted its existence.‡

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* Mr. Vincent treats all fractures and dislocations of the clavicle by merely placing the patients on flat beds, by which the parts assume and preserve their natural position. Bandages, he says, do little good commonly, and are not required if the patient keeps his bed. Op. cit.

† Quoted in Ranking's Abstract, vol. ii. p. 104.

‡ See a case by Mr. May, of Reading, Med. Gaz., 8th Oct. 1842. Mr. Wormald possesses a specimen, of which many casts have been taken by Mr. Wilmott, of St. Mary's Hospital Museum.

The *symptoms* described by Sir Astley Cooper are the following:—The shoulder appears sunk, and the arm lengthened; the acromion is usually prominent, and the deltoid dragged down and flattened; the head of the humerus can be felt in the axilla; and on placing one hand or one ear on the acromion, and moving the shoulder, crepitus may be detected. Crepitus may also be felt on pressing the coracoid process, which is situated deep below the clavicle, between the margins of the pectoral and deltoid muscles. The accidents with which this fracture is most likely to be confounded are fracture of the neck of the humerus, and dislocation of the shoulder joint; the symptoms of which should be carefully studied and compared. The existence of crepitus, and the fact that the surgeon can move the shoulder freely (although with great pain), are the chief points of diagnosis between this accident and dislocation.

Treatment.—The shoulder must be supported by the same sling, bandage, and pad that are used for fracture of the clavicle; but a short sling from the axilla of the injured side to the opposite shoulder should be used in addition to the long sling from the elbow to the shoulder. Union may occur in seven weeks. Opium, rest in bed, and warm fomentations; perhaps, leeches and purgatives, will be necessary for the contusion with which this fracture is accompanied.

FRACTURE OF THE ACROMION is known by a flattening of the shoulder, because the fractured portion is drawn down by the deltoid; and by an evident inequality felt in tracing the spine of the scapula. It may be distinguished from any dislocation, by noticing that the humerus may be freely moved in any direction, and that, on slightly raising the shoulder, the fragment is restored to its place. This is also a rare accident; and Mr. Fergusson believes that, in some of the supposed cases of ligamentous union, the detached portion was never united by ossification to the rest of the bone from birth.

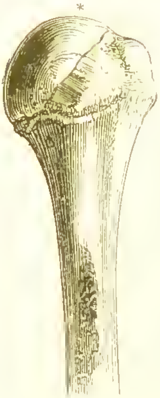
Treatment.—The same bandages, &c., are to be applied as for fracture of the clavicle; but great care must be taken to raise the elbow thoroughly, so that the head of the humerus may be lifted up against the acromion, and keep it in its place. Moreover, no pad must be placed in the axilla; otherwise the broken part will be pushed outwards too much. Union is almost always ligamentous, owing to the difficulty of keeping the parts in strict apposition.

FRACTURE OF THE CORACOID PROCESS is a rare accident, *caused* by sharp blows on the front of the shoulder.

Symptoms.—The patient is unable to execute the motions performed by the biceps and coracobrachialis; that is, to bring the arm upwards and forwards; and motion and crepitus of the detached process may be felt by pressing with the finger between the pectoralis major and deltoid, whilst the patient coughs or moves his shoulder.

Treatment.—The humerus must be brought forwards and inwards, so as to relax the biceps and coracobrachialis, and must be confined to the trunk.

V. FRACTURES OF THE HUMERUS.—*Fracture of the shaft* will be known at a glance by the limb being bent, shortened, and helpless, and by the crepitus felt when it is handled.



THE UPPER EXTREMITY OF THE HUMERUS may be fractured. 1, through the anatomical neck; 2, through the line of junction of the epiphysis; 3, through the surgical neck; 4, the greater tuberosity may be broken off; 5, the head may be dislocated from the glenoid cavity, and the cervix be fractured likewise.

(1.) Fracture *through the anatomical neck*, that is to say, within the capsular ligament. is a rare accident, difficult of diagnosis; there being scarcely any displacement: "The impairment of the motions of the joint and crepitus," says Dr. Smith, "are almost the only symptoms on which we can depend." There is one variety of this fracture in which the detached head of the bone is driven forcibly into and impacted in the reticular tissue of the head of the shaft, between the tubercles, one or other of which is usually broken off. "In this accident," says Dr. Smith, "the arm is slightly shortened, the acromion process projects more than natural, and the shoulder has lost, to a certain extent, its rounded form; the upper extremity of the shaft of the humerus is approximated to the acromion, and the entire of the globular head of the bone cannot be felt. In consequence of the fracture of the tuberosity, crepitus can be readily detected, when the shoulder is grasped with moderate firmness, and the arm rotated. The absence of a rounded tumour in the axilla, and the impossibility of feeling the glenoid cavity, are sufficient to enable us to distinguish this fracture from luxation."

(2.) Fracture at *the line of junction of the epiphysis*, called by Sir A. Cooper "fracture through the tubercles, or at the anatomical neck," is a not unfrequent accident in early life, and is usually caused by great and direct violence. *Symptoms.*—The head of the bone can be felt in the glenoid cavity (by which sign this accident is distinguished from dislocation); it remains motionless when the elbow is rotated; there is a striking and abrupt projection situated beneath the coracoid process, and caused by the upper extremity of the shaft of the bone, drawn inwards by the muscles which constitute the folds of the axilla. It may be felt rounded, smooth, and slightly convex, not with the sharp irregular margin of ordinary fracture: a slight extension from the elbow draws the broken point of the bone into its natural place, but it immediately projects again when the extension is discontinued: the axis of the arm is directed downwards, outwards, and backwards.

(3.) Fracture *of the surgical neck* presents nearly the symptoms of the preceding variety: the head of the bone felt in the glenoid cavity;

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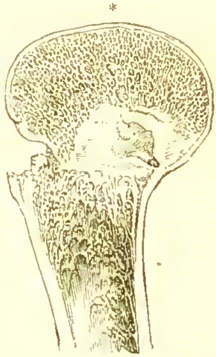
* This cut shows the line of fracture of the anatomical neck; and the line of junction of the epiphysis.

the elbow capable of being moved by the surgeon in all directions, whilst the head of the bone remains motionless; the projection of the upper end of the shaft under the pectoralis muscle; the deformity removed by extension, but returning when the extension is discontinued.

There is one variety of this accident in which the lower fragment is driven up and impacted in the cancellous tissue of the head of the bone. This complication adds materially to the difficulty of diagnosis, inasmuch as there is some deformity, but yet none of the usual signs of luxation, or of fracture of the neck of the bone. Crepitus may, however, be produced, if the surgeon very firmly grasp the head of the bone, whilst an assistant rotates the elbow.



(4.) Fracture *of the greater tuberosity* is usually caused by blows or falls on the shoulder. *Symptoms.*—Great breadth of the injured joint; slight projection of the acromion and flattening of the deltoid, though the finger cannot be sunk into the glenoid cavity as in a case of dislocation; the head of the bone drawn inwards by the axillary muscles, whilst the separated tuberosity is drawn outwards by the supra and infra spinatus and teres minor; a deep groove can be felt between the fractured tuberosity and the head of the bone; the latter of which can be felt to move in its socket when the elbow is rotated, and the whole limb can be moved in any direction by the surgeon.

All of the preceding fractures, even including the fracture of the anatomical neck, usually unite firmly by bone; for though fracture at this part would seem likely to deprive the head of the bone of all vascular connection and means of support, yet probably some ligamentous bands, which are sufficient for the purpose, remain untorn: in cases of impaction there is no difficulty. Yet the patient should be informed that some deformity is likely to remain, and some loss of motion, though time and use will go far to restore the latter.

(5.) In *fracture of the cervix humeri, with dislocation*, the head of the bone can be felt in the axilla, if the arm be raised; and it can be felt not to move when the elbow is rotated. The arm is shortened, and the broken extremity of the shaft can be perceived to move under the acromion. In treating this peculiar form of injury, it is generally found impossible to restore the head of the bone to its place; but the broken summit of the shaft must be brought into the glenoid cavity, and there be retained by a figure-of-8 bandage, and by keeping the humerus close to the side.

Treatment of Fractured Humerus.—In all cases it is advisable that the patient be confined to bed for a week or a fortnight, and particularly if the fracture be at the upper extremity of the bone: which latter accident will probably be followed by great pain and swelling, and require leeches, fomentations or cold lotions, purgatives, and opiates. The hand and forearm must be well and evenly bandaged, to prevent œdema, and the fracture be set, by steadying the shoulder, whilst the elbow is drawn downwards. Next, a long carefully-padded hollow splint should be placed on the inner side of the limb, bearing well against the axilla and the internal condyle, a second on the outer side from the acromion to the outer condyle, and perhaps a third and fourth, shorter, of pasteboard, before and behind. These must be fastened by bands of firm webbing, buckled. Then the arm being placed easily by the side,* a firm broad band must be passed round the body, so as to confine the elbow to the side, and a sling put on to relieve the weight of the hand and forearm comfortably, but not to thrust up the elbow.

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* Fracture of the surgical neck of the humerus, united.

In all cases the surgeon should take care to have the parts well washed with soap and water before the splints are put on, and whenever they are shifted; otherwise the confined perspiration may cause an intolerable itching, which tempts the patient at night to loosen the bandages. No wise man neglects trifles.

When the upper extremity of the bone is the seat of fracture, it is often difficult to apply any apparatus that shall tell upon the fragments, prevent deformity, and keep the arm at rest. The author, in such a case, gets a purchase from the opposite axilla, thus:—The middle of a long piece of firm webbing is sewn on to the top of the inner splint, which is well padded on both sides. This is crossed over to the other splint, to the edges of which it is fastened by a strong needle and thread. The ends are then brought, one before, the other behind the neck, to the opposite shoulder, where they cross over a large pad, and finally are attached to another large pad under the axilla. This secures the repose of the entire shoulder, if the elbow be properly secured as well. Sometimes instead of the outer splint, a firm well-fitting shoulder-cap of leather may be put on, being secured by a strap passing under the opposite axilla, and being likewise buckled round the humerus, close under the axilla. In one case, Mr. Tyrrell was obliged to keep the arm at right angles with the side, by means of a splint like the letter L upside down: and the surgeon's ingenuity will often be taxed to devise means suited for particular cases.

At the expiration of about five weeks, the patient may be allowed to swing the arm gently backwards and forwards, and gradually to bring it into use.

Fracture of the lower extremity of the Humerus may present many varieties. 1. There may be an *oblique fracture above the condyles*, which usually happens to children. The radius and ulna, with the lower fragment, are drawn upwards and backwards as in dislocation; but the natural appearance of the parts is restored by extension. 2. Either *condyle* may be broken off, and the fracture may or may not extend into the joint. 3. There may be one fracture *between the two condyles,* and another separating them both *from the shaft.* All these injuries may be distinguished from dislocation of the elbow by noticing that the motions of the joint are free, and are attended with crepitus above the elbow, and that the length of the forearm, measured between the condyles of the humerus and the lower extremities of the radius and ulna, is the same as on the sound side. The patient should be warned that it is very difficult to avoid all deformity and loss of motion.

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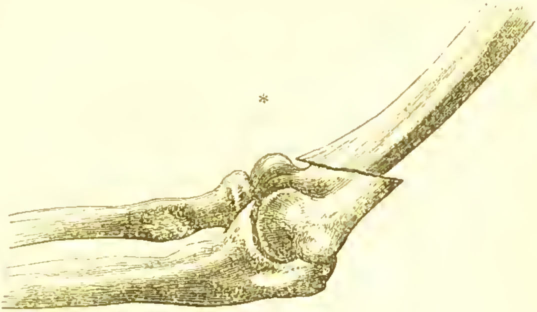
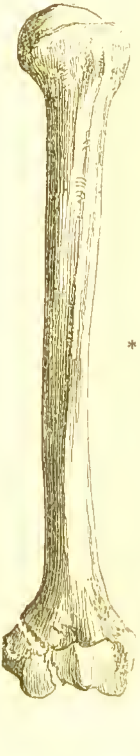
* In fracture of the humerus, just below the insertion of the deltoid, that muscle is apt to make the upper fragment project; but if the surgeon take care that the limb hang easily by the side of the body, this will soon cease.—Vincent, p. 13.



Treatment.—The fore and upper arm should be bandaged, and a piece of pasteboard, gummed sheeting, or leather softened in water, should be cut to a right angle, like the letter L, so as to fit the elbow when bent, and should be applied on the inner and outer sides, and be retained by another bandage.‡ But if the injury was attended with much violence, the patient must be confined to his bed for some days with the arm on a pillow, and leeches and lotions be employed to reduce the inflammation and swelling.

VI. FRACTURES OF THE FOREARM.—*Fracture of the olecranon* may be *caused* by direct force, or by violent action of the triceps muscle.

Symptoms.—The patient easily bends his limb, but



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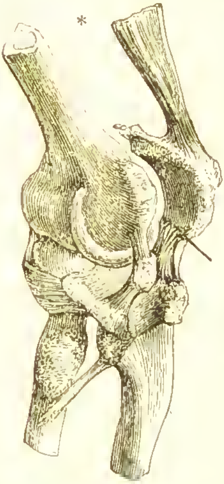
* Line of oblique fracture of the lower extremity of the humerus, and the kind of deformity.

† Line of fracture of the internal condyle.

‡ A very convenient angular splint is made by Matthews, and other instrument makers, capable of being adapted to various lengths and positions of limb, and useful in most cases of fracture of the arm or forearm.

has great pain and inability in straightening it. A hollow is felt at the back of the joint, because the broken part is drawn from half an inch to two inches up the arm; but sometimes, when the ligaments are not torn through, this displacement may be very trifling, or altogether absent.



Treatment.—The limb should be placed in a straight position. Then the forearm having been bandaged, the olecranon should be drawn down as much as possible, and the roller, continued from the forearm, should be passed round above it, and then back again about the elbow in a figure-of-8 form. Then the whole upper arm should be rolled, in order to prevent contraction of the triceps; and a splint must be placed in front, so as to keep the arm straight. The patient may be allowed to move the part gently in three weeks. Union will be ligamentous, unless the parts are in the closest apposition.

If there is much inflammation, it must be subdued by rest and leeches before any tight apparatus is put on. M. Malgaigne's hooks, p. 257, have been applied, in order to insure apposition.

Compound fracture of the olecranon is far from an uncommon consequence of violent blows or falls on the elbow; and it is often followed by protracted disease of the joint. The part must be bathed and fomented; any loose fragments of bone be extracted; the wound be closed with bloody lint, or collodion, if the skin can be neatly brought together; the elbow must be kept straight and motionless with a splint; leeches and fomentations be used to reduce inflammation; and when the wound is healed, and the joint free from active disease, gentle exercise must be employed to restore it to its proper uses. If the bones are so excessively comminuted as to render it probable that the process of reparation will be tedious and exhausting, excision of the joint should be performed; unless, indeed, the injury is so very severe as to render amputation indispensable.

Fracture of the Coronoid Process is very rare. It is caused by the action of the brachialis muscle. Mr. Liston gives a case of it which occurred to a boy of eight years old, and was caused by his hanging with one hand from the top of a high wall.

Symptoms.—Difficulty of bending the elbow, and dislocation of the ulna,—the olecranon projecting backwards.

Treatment.—The arm must be bandaged, and kept at rest in the bent position. Union will be ligamentous.

Fractures of the shafts of the Radius and Ulna, together or singly.

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* Fracture of olecranon. Ligamentous union. St. Mary's Museum.

are known by the ordinary signs of fracture, especially by the crepitus felt on fixing the upper end, and rotating or moving the other. The objects in the treatment are to prevent the fractured ends of either bone from being pressed inwards towards the interosseous space, and to prevent the upper fragment of the radius from being more *supinated* or *everted* than the lower.

Treatment.—The fracture is easily reduced by extension from the wrist and elbow. Then the elbow being bent, and the forearm placed in a position intermediate between pronation and supination (that is to say, with the thumb uppermost), one splint should be applied to the flexor side, from the inner condyle of the humerus to the fingers' ends; and another from the outer condyle of the humerus to the back of the wrist. Both splints should be wide enough, and should be well padded along their middle, so that they may prevent the bones from being pressed together. The hand should be kept in a line with the forearm. The cure is generally complete in a month or six weeks.

Fracture of the lower extremity of the Radius, from half an inch to an inch above the wrist, is now commonly called *Colles's fracture*, from the name of the eminent surgeon who first accurately described it. It deserves careful study from its liability to be mistaken for dislocation. The carpal extremity of the bone is usually broken off transversely, and the fragment is drawn backwards and outwards by the extensors of the thumb and supinator longus.[*] Of course the carpus and metacarpus go along with it. Thus, if the back of the forearm be looked at, there is seen to be an apparent swelling, formed by the carpus and lower fragment; and immediately above this a well-marked sulcus. On the palmar side is a more extensive but less prominent swelling, which seems as if caused by the flexor tendons being thrown forward: this swelling extends about one-third up the forearm, and terminates below at the anterior annular ligaments of the wrist. The extremity of the ulna is seen projecting towards the palm and inner side of the limb; sometimes it is even dislocated forwards. The chief points of distinction between this injury and dislocation, are the facility with which all deformity is removed by grasping the hand and making extension; the return of deformity on ceasing the extension; and the position of the

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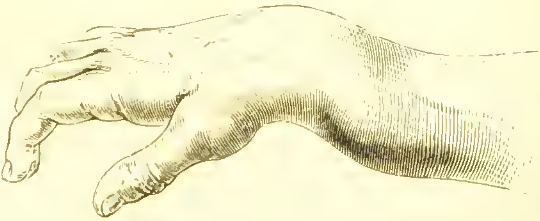

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[*] The above cut is copied from Dr. Smith's work on Fractures.

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styloid process of the radius, which moves with the hand if the case be fracture, but not if it be dislocation.

Other varieties of fracture at this part are, 1. Oblique fracture of the posterior margin of the articular surface of the radius, with partial dislocation of the hand backwards: 2. Fracture of the lower end of the radius, with displacement forwards: 3. Fracture of both radius and ulna, which may be recognised by attention to the symptoms presented.

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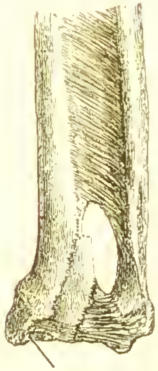

Treatment.—The elbow being bent and steadied, the hand should be grasped and powerfully extended, and at the same time somewhat adducted. A pad should be placed along the extensor side of the forearm, and the thickest part of it should correspond to the displaced fragment of the radius, against which it should press, so as to push it forwards, and somewhat in the prone position as well. Another pad should be placed on the flexor side, but should not reach lower than the margin of the superior fragment. "An anterior and a posterior splint," says Dr. Smith, "are then applied, each of which should be at least an inch broader than the forearm; the posterior should extend from the elbow to the fingers, and should be curved from the wrist downwards to receive the adducted hand; the anterior need not descend below the palm of the hand; a roller is then to be carried around the splints in the usual manner." Three weeks should elapse for a young patient, and four or five for an old one, before the wrist is moved; and the patient should be informed at first that some months will elapse before the use of the part is restored.

VII.—FRACTURE OF THE HAND.—The *carpus* is rarely fractured without so much other injury as to render amputation necessary. Fracture of the *metacarpal bones*, or of the *phalanges*, will be readily recognised. With respect to compound fracture of these parts we may observe, that no part of the hand should be amputated unless positively necessary, and even one finger should be saved if it can be done.

Treatment.—For fractures of the carpus, middle metacarpal bones, and first phalanges, it is a good plan to make the patient grasp a ball of tow or some other soft substance, and bind his hand over it; for fracture of the lateral metacarpal bones, it is better to support the hand on a flat wooden splint, cut into the shape of the thumb and fingers. If one finger only be fractured, it may be confined by a thin lath or pasteboard splint. It must be recollected that the palmar surfaces of the metacarpal and digital bones are concave. They must, therefore, be slightly padded before they are bound to any flat surface, or they will unite crookedly.

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* Vertical fracture of lower extremity of radius. Fracture also of styloid process of ulna, with ligamentous union. From a preparation of the late Mr. Wilmott's, of St. Mary's Hospital.

VIII. FRACTURE OF THE RIBS is generally situated in their anterior half, and is commonly caused by *direct* violence, such as blows; the bone giving way at the point struck. Sometimes, however, it is caused by *indirect* violence; as, for instance, when the chest is violently compressed between two points. In 1837, several people were crushed to death in a crowd in the Champ de Mars, in Paris, and many of them were found to have several ribs broken in this manner. Sometimes, in old subjects, one or more ribs are broken by violent coughing.*

Symptoms. — Fixed lancinating pain, aggravated by inspiration, coughing, or any other motion. By tracing the outline of the bone, or by placing the hand or the stethoscope upon it, crepitus may be felt during the act of coughing or inspiration, and the patient is sensible of it likewise. If the fracture be situated near the spine, or if the patient be very corpulent, it may be difficult to detect it with certainty: but this is of little consequence; for in every case, when a patient complains of pain on inspiration, after a blow on the chest, the treatment is the same.

Treatment.—The indications are, 1. To *diminish motion* of all the ribs, by passing a broad flannel roller, or a towel fastened with tape round the chest, so tightly, that respiration may be performed chiefly by the diaphragm. The bandage should have shoulder-straps to keep it up. The arms should be confined to the side so as to prevent all motion of the scapula; and this latter in fat women is all that can be done: moreover, there are some patients who find all bandages intolerable, but who do very well by being kept quiet in bed. 2. To *prevent inflammation* of the chest, keep the respiration easy, and relieve pain or cough, by rest in bed, by purgatives, and opiates; bleeding if necessary.

Emphysema, a swelling caused by the presence of air in the cellular tissue, is an occasional complication of this fracture. It is produced in the following way:—The extremities of the fractured rib perforate both *pleuræ* and wound the lung. In the act of inspiration, air escapes from the lung into the cavity of the pleura, and from thence through the wound in the *pleura costalis* into the cellular tissue of the trunk. *Emphysema* forms a soft puffy tumour, that crepitates and disperses on pressure.

Treatment.—"The first object," says Mr. Vincent, "is to adapt a firm bandage over the part of the rib broken, by which the effusion of air into the cellular tissue under the integuments is stopped. The air passing from the wounded lung is now confined to the cavity of the pleura, with which it is filled, compressing the lung. By this means the wound which was made whilst the lung was dilated, is more completely closed than would have been done with any contrivance of art. This wound is usually healed on the eighth day: at that period the breathing greatly improves," † and the case is soon reduced to one of simple broken rib.—See the Chapter on the Injuries of the Chest.

IX.—FRACTURE OF THE STERNUM. *Symptoms.*—Crepitus may be felt during inspiration or other movements of the trunk, and displacement (if any) can be detected by examination.

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* See an interesting paper on Fracture of the Ribs, by M. Malgaigne, in the Arch. Gén. de Méd. 1838, quoted in B. and F. Med. Rev. vol. vii. p. 551.

† Vincent, op. cit. p. 47.

Treatment.—The same as for fractured ribs.

[*]

X. Fractures of the Pelvis can be caused only by most tremendous violence, and are often attended with some fatal complication;—such as laceration of the bladder or rectum, or of the great arteries or veins.

Treatment.—The only thing to be done is, to place the patient at perfect rest, and in as easy a position as possible; to keep a catheter in the bladder; to make incisions if urine is extravasated into the perinæum, as it will be if the urethra is lacerated by fractured portions of the rami of the ischium and pubes, and to treat any symptoms that may arise. If it can be borne, a broad belt may be passed round the pelvis; and another under the nates, which might be attached to a pulley over the bed, so that the patient may raise the pelvis, without exerting any of the muscles attached to it.

There are some cases of fracture of the os innominatum passing through the acetabulum, and caused by falls on the hip, which might be mistaken for fracture of the cervix femoris. For instance, in some cases related by Mr Earle,[†] the foot was everted, and there was loss of prominence of the trochanter; but there was no shortening, and the limb could be turned freely outwards, which motion is highly painful after fracture of the neck of the femur. In a case reported by Dr. George D. Gibb, late of Montreal, now of Portman Street, in which the right side of the pelvis was literally smashed, the leg was everted and shortened an inch and a half; the trochanter nearer the anterior superior spinous process than on the sound side. On rotating the limb, the right trochanter appeared to move in the segment of a smaller circle than the left, and crepitus was distinctly felt in the joint. The diagnosis will be aided by the crepitus felt on applying the stethoscope to the ilium, and by examination per anum. It very rarely happens that the acetabulum and cervix femoris are both fractured. The patient must be kept on a fracture-bed. One of Mr. Earle's cases was cured in eight weeks, Dr. Gibb's in sixteen.[‡]

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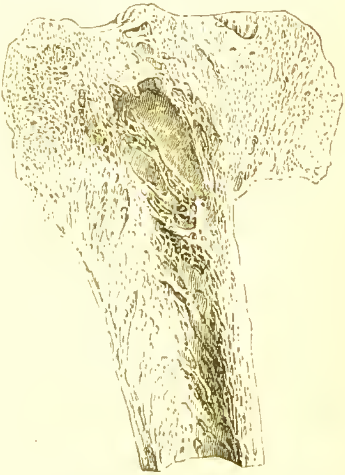
[*] Fractured pelvis. St. Mary's Museum.

[†] Earle on Fractures of the Pelvis, Med. Chir. Trans. vol. xix.; see also case lxxi. in the last edition of Sir A. Cooper on Fractures and Dislocations

[‡] British American Journal, Sept. 1849.

Fracture of the *os coccygis*, or of the lower extremity of the sacrum, may be caused by violent kicks or falls; the former may occur during parturition to women who have children after the coccyx is united to the sacrum. The loose portions must be replaced by introducing the finger within the rectum. The patient should keep in bed, and the bowels must be kept relaxed, so that no disturbance may be occasioned by hard stools.

XI. FRACTURES OF THE FEMUR present many varieties, which must be carefully studied; because, as Pott observes, "they so often lame the patient and disgrace the surgeon." We must, therefore, treat separately, 1, of fracture of the neck of the femur internal to the capsular ligament; 2, of fracture of that part external to the capsular ligament; 3, of oblique fracture through the great trochanter; 4, of fracture separating the epiphysis of the trochanter major; 5, of fracture just below the trochanter; 6, of the shaft; 7, of the condyles.



(1.) *Fracture of the cervix femoris internal to the capsule* is generally caused by *indirect violence;* that is, by a slight force acting on the lower extremity of the limb, as happens in slipping off the curbstone; sometimes, however, it is produced by falls or blows on the hip. It is very rare in persons under fifty; but very common in old people, especially old women; because this part of the femur seems to suffer first, and chiefly, from the atrophy and fatty degeneration which all the bones, more or less, experience in advanced life.*

Symptoms.—After a blow or fall the patient finds himself unable to

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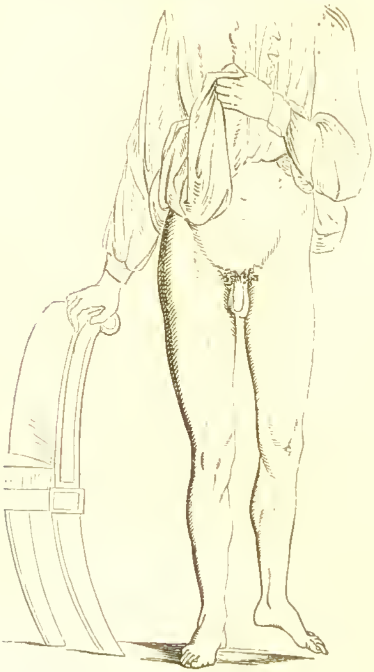
* It is sometimes stated that the neck of the femur is commonly shortened in old persons, and sunk from the oblique to the horizontal posture; but it is doubtful whether this is the case, except when the joint has been affected with *chronic rheumatic arthritis*. In this disease, which often affects old bedridden persons, the acetabulum is expanded and surrounded with irregular bony growths; the cartilage removed and replaced by porcellaneous deposit; the neck of the femur shortened so that the head is almost in contact with the top of the shaft; the capsule thickened, with irregular growths of bone around it (which have sometimes been mistaken for a misplaced effort of nature to repair a fractured cervix); sometimes at the part where the capsular ligament is inserted, the bony texture is completely absorbed, and its place supplied with a ligamento-cartilaginous substance; appearances which have been mistaken for united fracture. Smith, op. cit.; Edwin Canton's Surgical and Pathological Observations, Lond., 1855. See page 256.

tand, and complains of great pain, increased by motion, and principally seated at the upper and inner part of the thigh. The leg is shorter than the other;—the foot turned outwards;—the heel rests in the interval between the ankle and tendo Achillis of the other leg; *crepitus* may be detected if the hand or the stethoscope be placed on the trochanter, whilst the limb is *drawn to its proper length* and rotated. When extension is discontinued the limb shortens again. The trochanter generally projects less than on the other side; and if the foot be rotated by an assistant, it is felt to move in a segment of a lesser circle than natural. The limb may generally be freely moved by the surgeon, although with great pain, especially if it is abducted; but the patient cannot lift it from the bed.

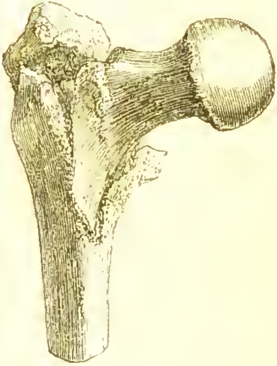


The above symptoms are liable to considerable diversity, arising from accidental variations in the manner in which the fracture occurred. Thus (*a.*) the *amount of shortening* (which was stated by Sir A. Cooper at from one to two inches) depends on the degree to which the fibrous investment of the neck is lacerated. If that membrane be not much injured, the shortening may be much less than an inch; moreover, it is doubtful, according to Dr. Smith, whether the capsular ligament, if entire, would permit the limb to be drawn upwards for more than an inch. Again, if the fibrous investment of the neck be not torn, or if the fracture be very oblique, so that the upper opposes the ascent of the lower fragment, or if the lower be driven into and impacted in the upper fragment, there may be no immediate shortening at all.

(*b.*) The *time at which shortening occurs* may vary. Sometimes it is very slight at first, but becomes very decided in *a few days*, doubtless when the muscles have recovered from the paralysing effects of the injury. Sometimes, in an obscure case of fracture, the limb retains its natural length for a few days or weeks, and then *suddenly shortens*, whilst the patient is attempting to walk: doubtless because the attempt has caused the laceration of some untorn fibres of the periosteal investment of the cervix, which before held the fractured parts in apposition. In other cases the limb *gradually* shortens to the extent of one or two inches during the six months succeeding the injury. This is owing to interstitial absorption of the neck of the femur.

(*c.*) The *position of the limb* is sometimes anomalous; being inverted in a few cases.

(*d.*) In some cases the neck of the bone is driven into, and impacted firmly within, the cancellous tissue of the head; a circumstance which of course renders it difficult to say whether the injury be one of fracture or of mere contusion. The chief characters of this injury are those summed up by Dr. Smith. "1. Slight shortening of the limb. 2. Slight eversion of the foot. 3. Absence of crepitus. 4. Great difficulty in all cases, and in the majority an impossibility of removing the shortening of the limb by extension; and, lastly, less loss of power than in other forms of fracture of the neck of the femur."



Prognosis.—This fracture does not unite by bone, except in the rare instances in which the broken surfaces are held closely together by the untorn periosteum, or by impaction; or in which the fracture is partly internal and partly external to the capsular ligament. In such cases there is no doubt that bony union may occur; but in the majority the fracture either unites by ligament, or, more commonly, does not unite at all; but the stump of the cervix becomes rapidly absorbed, rounded, and covered with a smooth porcellaneous deposit, and plays in a socket formed by the hollowing and absorption of the head. The capsular ligament becomes excessively thick, and so does the obturator externus muscle, so as to support the weight of the body. The reason of this non-union is, probably, the want of apposition and of pressure of the fractured surfaces against each other; to which may be added the age and debility of the patients; the atrophy of the part injured; the imperfect nourishment of the upper fragment, and the general indisposition of bones covered with synovial membrane to throw out callus.

Diagnosis.—The surgeon should be aware that a fall on the hip is apt to produce interstitial absorption and shortening of the neck of the femur, with disappearance of the cartilage, eburnation of the articular surfaces, and irregular deposit of bone around the cervix (the same series of changes which the part undergoes in chronic rheumatic arthritis), with shortening of the limb, and wasting of the muscles; with most of the conditions, in fact, that follow a fracture. Thus, the patient on recovering from the immediate effects of the injury, finding the limb lame and shortened, may accuse the surgeon of having overlooked a dislocation or fracture. Of course the surgeon must defend himself by proving the absence of the symptoms of these injuries immediately after the accident, and by reference to authenticated cases in which the same ill consequences have followed bruises without fracture.*

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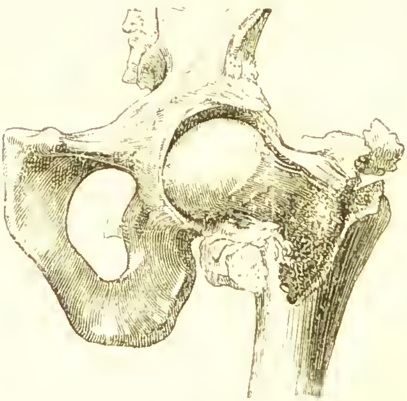
* Impacted fracture of neck of femur. St. Mary's Museum.

Treatment.—If the patient is very old and feeble, it is of no use to sacrifice his little remnant of health and strength, and run the risk of producing sloughing of the nates by long confinement to bed, in the hope of procuring union by bone. But he should be kept in bed for a fortnight, till pain and tenderness abate; with one pillow under the whole length of the limb, and another rolled up and placed under the knee. Then he may get up and sit in a high chair, and shortly begin to crawl about with crutches; and in time he will regain a tolerable use of the limb, especially if not very corpulent. The sole of the shoe must be made thick enough to counteract the shortness of the limb. It must be added, that this injury often proves fatal during the first three weeks from the shock to the constitution, or from the bruises inflicted on the limb.

(2.) *Fracture external to the capsular ligament* is caused by direct violence, such as falls or blows on the hip, by which the neck of the femur is broken off, and driven into the cancellous structure of the great trochanter; and at the same time one or both trochanters are split through likewise. If the cervix be firmly impacted, and the trochanters are still adhering by untorn periosteum, the diagnosis of this fracture presents obvious difficulties, for there is no crepitus; the limb is shortened, but yet cannot be brought to its natural length by any justifiable amount of extension, and is not so everted nor so powerless as is usual in fracture; yet if the distance of the trochanter from the anterior superior iliac spine be measured, it will be found less than on the opposite side. If, however, this fracture be so comminuted, that the cervix is not impacted in the shaft, the shortening and eversion are well marked, and crepitus can be produced on extension and rotation.



(3.) *Oblique fracture through the Great Trochanter.*—This accident may occur at any period of life, and is attended with the following symptoms:—the limb is everted, but very little shortened, and the shaft of the bone can be felt widely separated from the trochanter. This fracture unites readily by bone; and the treatment required consists of extension of the limb by the long splint, and a circular girth with a pad, to support the upper extremity of the shaft, and keep the broken surfaces in apposition.

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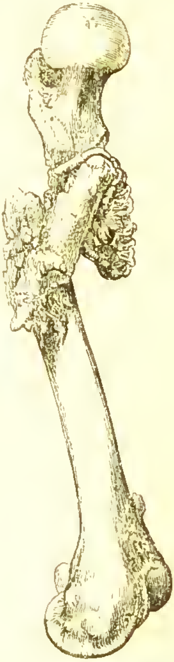
* Smith, op. cit.; Canton, on Interstitial Absorption of the Neck of the Femur from Bruise, &c. Med. Gaz., Aug. 11, 1848.

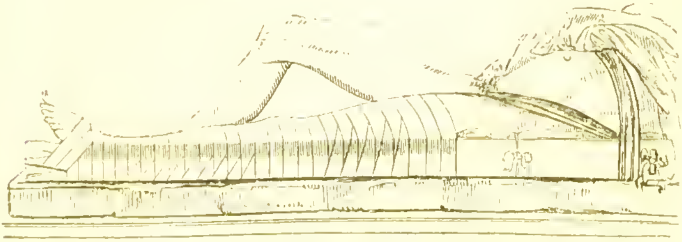


(4.) *Fracture of the Epiphysis of the Trochanter Major.*—The trochanter is sometimes broken off from the femur, at the part where it is united by cartilage, as an epiphysis in youth. The diagnosis is generally obscure; but we allude to the accident in order that the surgeon may be aware of the possibility of such an occurrence. The part will unite by ligament.

(5.) *Fracture of the Femur just below the Trochanters* is liable to be followed by great deformity, because, as Sir A. Cooper said, the upper fragment is tilted forwards by the psoas and iliacus. Yet Mr. Butcher has shown that it is generally the lower fragment which is drawn upwards and outwards.*

(6.) *Fracture of the shaft of the Femur* requires no observations as to its causes or *symptoms.*

Treatment.— For all cases of fractured thigh, including those of fracture of the cervix, in which the patient's strength admits of a reasonable effort to procure union, the *long splint* is the best instrument. The common long splint, known as *Liston's*, is represented in the next cut. It is a narrow deal board, of a hand's breadth for an



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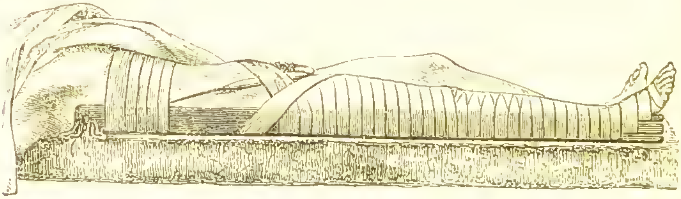
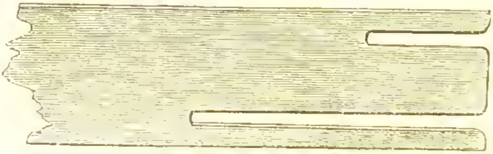
* Butcher on Fractures of the Femur, Dublin Quarterly Journ. Med. Sc., Feb. 1853.

adult but narrower and slighter for a young person. It should be long enough to reach from below the axilla to four or five inches below the foot. At its upper end it has two holes, and at its lower end two deep notches, with a hollow for the outer ankle.

First, the splint should be thoroughly well padded with layers of blanket. Then the limb should be evenly bandaged from the toes upwards, and gently extended to its proper length and shape. Next, one fixed point of extension is made by passing a bandage repeatedly round the instep and ankle, and through the notches at the lower end of the splint. Next, the splint is thoroughly secured to the limb by a bandage carried upwards. Lastly, the extension, which is to be kept up by the hands of assistants during this process, is to be maintained by means of a *perineal band*, which is passed round the groin, and through the holes at the top of the splint.

The next cut shows an improved form of the long splint, employed by Mr. Haynes Walton. It will be seen that it does not extend below the foot, and that it has two splits of unequal depth, through which the bandage is passed, so as to get a thorough purchase from the ankle (not from the heel and dorsum of the foot), and to keep the splint square with the leg. The ankle should be well padded. For a perineal band, Mr. Walton recommends a fold or two of blanket, or several folds of flannel, sewed up in oiled-silk, and having a piece of stout tape tacked to each end.





In order to prevent the galling of the perineal band, and its supposed tendency to draw the fractured parts asunder, Mr. Fergusson had adopted the plan in some cases of making counter extension from a strong stay of jean, accurately fitted to the upper third of the opposite thigh; from which a band extends back and front to the upper end of the splint. This is very comfortable, and obviates the necessity of the band round the belly, since it draws the splint *towards* the body.

Mr. Fergusson has devised a modification of the straight splint, consisting of a long iron bar, of the length of the ordinary straight splint; the upper half of which can be unscrewed and removed, so as to make it a short splint, for fracture below the knee. It has a foot-board, which can be adapted to any length or thickness of limb, and to any portion of the knee or ankle-joint.*

2. A second plan is that of Pott.† It consists in laying the patient on the affected side, the thigh at right angles to the trunk, and the knee bent—with a many-tailed bandage and four splints, applied between the pelvis and trochanter above, and the knee below. The disadvantages of this plan are, first, that the patient soon turns round on his back, dragging the upper fragment away from its right place; and, secondly, that the pressure on the great trochanter may cause sloughing. The first evil may be prevented simply by watching the patient, and telling him to turn round on his belly rather than on his back, if he wishes to shift his position. The second may be remedied by placing him on his back, at the end of a fortnight, with his knees bent up, and supported by pillows.

3. A third plan of treatment is by the *fracture-bed*, of which the best modification is that of Mr. Torry Hester, of Oxford. The patient is placed on his back; the thigh and knee bent up over a double inclined plane, in which position they are kept immoveably. But the whole bed is placed on a sort of hinge, so that the patient's trunk can be raised or lowered, without causing any motion of the hip-joint.‡

4. The starched bandage may be employed in fracture of the lower third.

If *both thighs* are broken, a fracture-bed may be employed, if the surgeon has one.

(7.) *Fracture of the Condyle into the knee-joint* mostly happens to old persons, and not unfrequently proves fatal.

XII.—FRACTURE OF THE PATELLA may be of two kinds, according as it is caused, (1,) by muscular action, or, (2,) by direct violence.

1. *Fracture of the Patella by Muscular Action* generally occurs thus: A person is in danger of falling, perhaps from missing a step in going down stairs, or from missing his footing after a leap. The knee is bent, and the patella drawn up; and then a sudden contraction of the rectus snaps it across. The *symptoms* experienced by the patient are, the feeling as of a blow or sudden snap, and inability to straighten the knee. The surgeon, on examination, finds a chink between the broken parts, into which he can press his finger, and which is increased by bending the knee.

This, as we have already said, is one of the fractures in which it is very difficult to produce reunion by bone, in consequence of the difficulty of bringing the broken surfaces into exact apposition. And not only so, but even when the patient's recovery is considered complete, the fragments are apt to be left in a state of very wide separation; the power of the extensors, and, consequently, of straightening the knee, and of keeping it straight, is lessened or almost lost, and the patient is not only lame, but in constant danger of falling, and of again rupturing the connection between the fragments, or else of breaking the opposite patella.

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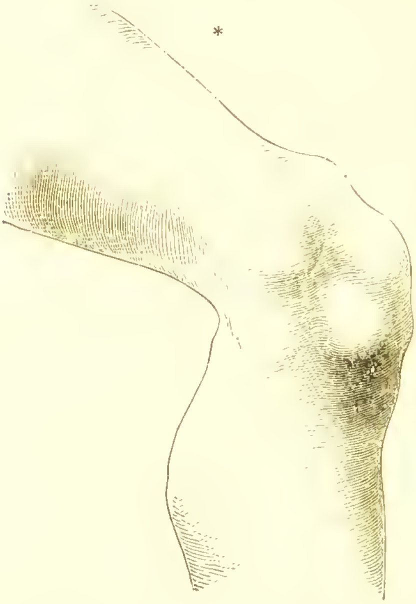
* Many forms and varieties of this splint are manufactured by Matthews, of Portugal Street, Weiss, and Savigny.

† Pott, Chirurgical Works, vol. i. p. 365.

‡ A New Method of managing Fractures, by James Torry Hester, 1853.



The exact pathology of this accident has been very minutely studied by Mr. William Adams, who has shown, in the first place, that the fragments may be united by true ligamentous substance, a firm mass of new tissue, generally from half an inch to an inch long, and passing between the broken surfaces. This is represented in the diagram A (next page); and if the ligament is short, the cure is a good one.

But, in the second place, Mr. W. Adams has shown that in the cases in which the patient recovers with wide separation of the fragments (and in some cases this is so much as four or five inches), there is no ligamentous union at all; but the fragments are merely held together by the subcutaneous fascia in a thickened condition. So that what is commonly called union by a long ligament is in reality no union at all.

The conditions under which this failure of union occurs are shown in the diagram. In the first place, wide separation of the fragments renders union very unlikely. But, in addition, at B and C is shown the tendency which the fragments have to become everted. Then if the fascia folds over, and adheres to one of the fractured surfaces, as at C, or to both, as at B, union becomes physically impossible; and the fascia, somewhat thickened, is the only, and a very inadequate bond of union.

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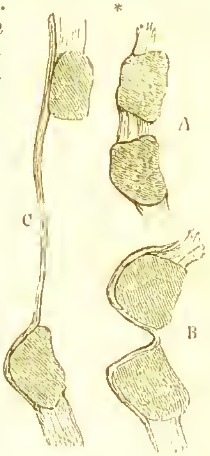
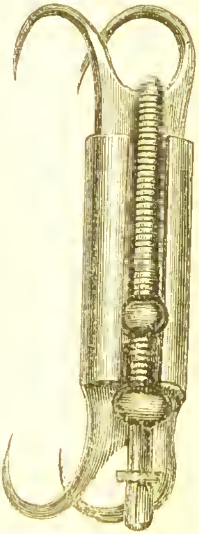
* This cut represents an old fracture of the patella, with wide separation of the fragments. The patient fractured the bone twice. The first time, he was treated with bandages, &c., to bring the broken parts together, and they united well. The second time, the limb was laid in an easy position without bandages. The result is here shown:—The upper fragment high up in front of the femur; the lower one down in front of the tibia; the power of extending the joint lost. When the knee is bent, as in the above cut, the condyles of the femur are seen with the skin tightly stretched over them.



In the *treatment* there are three indications. *First*, to place the patient in such a *position* that the muscles which tend to draw the fragments asunder may be relaxed. For this purpose, the patient's trunk should be somewhat raised in a half-sitting position, and the injured limb, with a well-padded long straight splint behind it, should also be somewhat raised, but *not enough to stretch the hamstring muscles.*

Secondly, to bring the fractured surfaces into as close apposition as possible. In some cases there is so little separation, that no apparatus is required. In others, it suffices to place a simple pad, or strap, or bandage above the upper, and another beneath the lower fragment, and to draw them together by longitudinal straps passing between. The same end may perhaps be gained by a figure-of-8 bandage. A leather strap may be fastened round the limb, just above the patella, and a tape passing from each side of this may be fastened to a slipper on the foot. Or an attempt may be made with a starched bandage, applied from the foot to the middle of the thigh, and pressing *above*, but not *upon* the patella.



But in all such apparatus there are two difficulties: that they are liable to cause the fractured surfaces to be tilted up, as in diagram B; and that they may pull upon the skin, and not the bone, and so may pucker in the skin between the fragments, and so do more harm than good.

The formidable-looking instrument here depicted was devised by M. Malgaigne, in order to hold the fragments firmly together. Two of the hooks are fixed into the tendon at the upper edge of the bone, and two into the lower, and they can be brought and kept in apposition by the screw. They *cannot* penetrate the bone, nor wound the joint. They may be kept in six weeks, to insure bony union. Malgaigne had treated (1853) about eleven patients, producing bony union, and no bad results.

Thirdly, inflammation must be sedulously prevented if possible. If it comes on, it must be removed by leeches, cold lotions, or warm fomentations, and purgatives; and no constricting apparatus should be applied during this condition.

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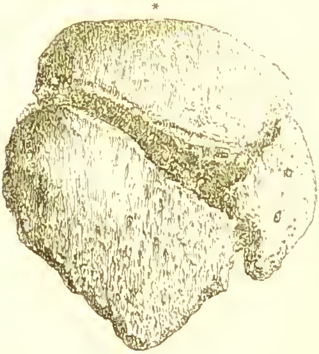
* See Mr. W. Adams's paper in Pathological Transactions, vol. ii. p. 251. The author has to express his obligations to Mr. Adams for allowing him to consult some valuable MSS., including a letter from M. Malgaigne.

In such a case as that depicted and described at p. 256, it has been proposed to scrape off the aponeurotic membrane, which adheres to the broken surfaces, by subcutaneous section, and then to apply the hooks.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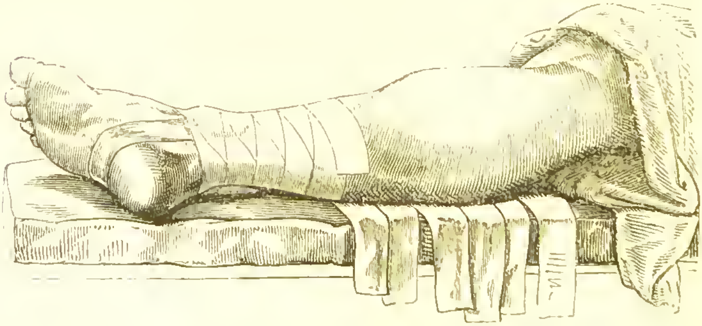
2. *Fracture by direct violence* is generally comminuted; perhaps longitudinal. There is usually much inflammation, and not much separation of fragments: so that position and bandages suffice, after inflammation has been subdued.

3. *Compound Fracture* of the knee-joint will require excision or amputation, if the skin is very much torn, or the bones comminuted; and amputation if the popliteal vessels are injured likewise. If the vessels are entire, the bone not comminuted, nor the skin torn away, an effort may be made to save the limb.

XIII. Fractures of the Leg.—The ordinary fractures of the leg may be readily distinguished by careful examination. There are several methods of treatment.

(1.) *By the common splints.*—The injured leg being laid on its outer side, the fracture is reduced by extension from the knee and ankle.



Then a many-tailed bandage is applied by some surgeons after the manner represented in the cut. This bandage is easily made thus:—take a piece of roller, long enough to reach from the knee to the foot, and to overlap about one-third of the leg besides. Cut another roller into pieces, and lay them across the first at right angles, in such a manner that each shall overlap one-third of the preceding one; these transverse pieces (which should be half as long again as the circumference of that part of the leg which they are to encircle) are to be stitched to the longitudinal one, and then the bandage is ready for use. One splint, well padded, should be applied to the outer side of the limb; another to the inner side; and if there is any projection of either fragment, it should be kept in its place by a third slight splint to the shin. The outer splint should have a foot-piece, which should be carefully padded in such a manner as to prevent the foot from turning either inwards or outwards, especially the latter. There is a very useful rule, which should be attended to in all cases of injury below the knee; it is, *to keep the great toe in a line with the inner edge of the patella.*

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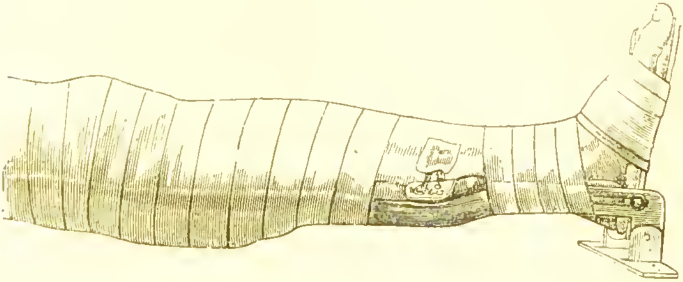
* Comminuted fracture of the patella, partially united by bone. From a patient of Mr. Partridge's.

(2.) By the Macintyre's leg splint, or some of the numberless varieties of it in existence, as improved by Mr. Liston and other surgeons. The adjoining cut represents it as applied to a patient of Mr. Fergusson's in the King's College Hospital, with a compound fracture, which is left uncovered by the bandages. It is straightened out by means of the screw under the knee, as Mr. Fergusson prefers the straight position in almost all cases of fracture of the lower extremity. Before its application, it must be made to correspond to the length of the sound limb, and must be well padded.



(3.) By the very convenient *side-splint* of Mr. Fergusson's, described in a preceding page. This may be applied either on the inner or outer side, according to circumstances.

(4.) By the *junks.*—This very simple but efficient contrivance consists of a piece of old sheeting, with a bundle of reeds rolled together from either end. But it is more easy to comprehend it from seeing it once than from a page of description.

(5.) *By the starched bandage.*—In simple cases of fracture of the leg, the patient may be permitted to leave his bed at the end of a week, with the fracture supported by the starched apparatus. When this has become dry, the patient may get up, and move to his chair or sofa with crutches, but the foot must be suspended from his neck by a sling; and he must be particularly cautioned not to attempt to move it by its own efforts.

Lastly. In all cases of fracture of the leg, it is a good plan to suspend, or swing the injured part, by means of Dr. Salter's or some similar apparatus. It is not only more comfortable for the patient. but it allows of the use of the bed-pan, with much less risk of disturbing the fracture.*

For FRACTURE OF THE HEAD OF THE TIBIA INTO THE KNEE-JOINT the treatment is the same as for fracture of the condyles of the femur. The limb should be placed straight, so that the end of the femur may act as a splint, and keep the broken parts in their places. The whole limb should be raised, so as to relax the extensor muscles of the knee; and this should be done in *all cases of fracture of the upper end of the tibia* (for which, consequently, the treatment by splints, with the knee bent, is inapplicable). Pasteboard splints and starched bandages should be applied to keep the joint motionless; but they should not cover the front of the knee. *Passive motion* should be commenced in about five weeks.

FRACTURE OF THE LOWER END OF THE FIBULA, about three inches above the ankle-joint, is not an uncommon accident, and may be caused by twists of the foot, or by jumping on uneven ground.

FRACTURE OF THE INTERNAL MALLEOLUS may occur in the same way; and one or the other of these fractures commonly accompanies dislocation of the ankle.

Treatment.—They may be treated either with the bandage and two splints, or with Macintyre's splint, or with Fergusson's side-splint, or with Dupuytren's, which is a diminutive of the long straight splint, represented at p. 253. It is to be well padded, and applied to the side opposite the fracture; but it is not so easy to keep the foot in a proper position with this as with the other apparatus.

The surgeon will often find one or more *bags of sand* most convenient auxiliaries in keeping fractures of the leg in proper position. They may be used both to lay the broken limb upon, and also to put on either side to prevent the limb from rolling. This substance is so ponderous and devoid of elasticity that it steadily retains whatever position is given to it.

Compound fractures of the leg are to be treated on the principles already laid down for the treatment of compound fracture in general.

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* The apparatus is made by Matthews of Portugal Street, Lincoln's Inn. Some cases of fracture of the lower end of the thigh likewise admit of this treatment.

XIV. FRACTURES OF THE FOOT will often be attended with so much other mischief as renders amputation expedient. But an attempt should be made to save part of it; especially the ball of the great toe. Pasteboard splints and other contrivances must be used to preserve the proper position; and if matter forms, there should be no delay in freely dividing the dense fasciæ of the foot, to let it escape.

The tuberosity of the os calcis may be broken by the action of the muscles attached to it, in the same manner as the patella and olecranon, and like these parts will probably unite only by ligament. The treatment must be the same as that of ruptured tendo Achillis.

CHAPTER VI.

DISEASES AND INJURIES OF THE JOINTS.

SECTION I.—THE SYNOVIAL MEMBRANE.

1. ACUTE INFLAMMATION of the synovial membrane (or *synovitis*) may be produced by *local* or by *constitutional* causes. The former are, blows, strains, mechanical injuries, and especially penetrating wounds. The latter are, exposure to cold, and the rheumatic, gouty, syphilitic, mercurial, and sometimes the gonorrhœal poisons. It very seldom attacks young children. The joint most frequently affected is the knee.

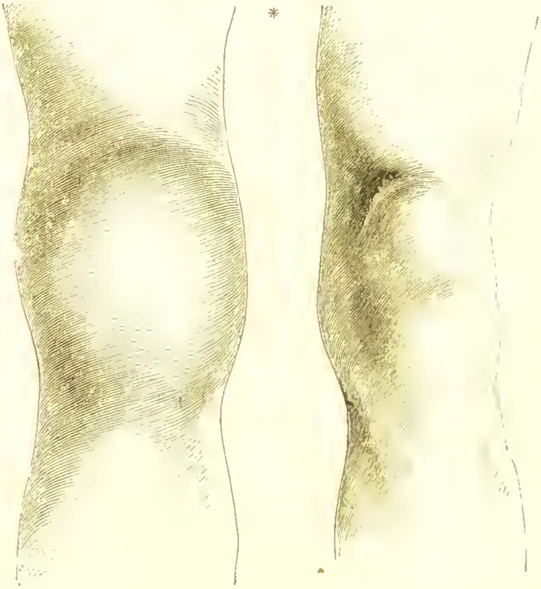
Symptoms.—In the most acute form, the symptoms are severe aching pain in the joint, aggravated by the slightest motion; great swelling *occurring very soon after the pain*; redness and tenderness of the skin; and fever, which is often violent and alarming.

The swelling is peculiar, and is distinctive of the disease. It is occasioned by a rapid effusion of fluid into the synovial cavity; and, consequently, if the joint is superficial, it fluctuates freely. It is always most prominent at the points where the joint is least covered by ligament, and, consequently, the shape of the joint is always altered. When the knee is affected, the patella is protruded forwards, and there is a great fulness at each side of it, and at the lower and front part of the thigh. In the elbow, the swelling is most distinct above the olecranon, and in the hip and shoulder there is a general fulness of the surrounding parts.

Prognosis.—This disease is much more serious when it affects one joint solely, and more particularly when it arises from local injury (especially a penetrating wound), than when it affects many joints, and arises from constitutional disorder. The danger to life in any case will be proportionate to the severity of the febrile symptoms, and the rapidity and sharpness of the pulse; delirium, or typhoid symptoms, show great peril.

Morbid Anatomy.—In slight cases the synovial membrane is reddened, and the joint contains a quantity of turbid serum. In very severe cases the membrane suppurates rapidly, and the cartilage entirely ulcerates. In other severe, but more protracted cases, the membrane becomes thickened, pulpy, and highly vascular; granulations form on its surface and project like fringes into the cavity of the joint, and at the same time the cartilage ulcerates.

Treatment.—In all cases arising from injury, the joint, or rather the whole limb should be confined by a splint, so as to keep it perfectly motionless. This is indispensable; for the joint cannot be kept motionless without it. The best splint is very thick leather or pasteboard, which admits of being easily adapted to the surface of the joint when softened in warm water; but, during the acute stage, a long wooden splint, properly padded, should be arranged so that it may be fastened to the limb at some distance above and below, and so that it may not touch the joint itself. If the knee is the part affected, it should not be allowed to become bent on the thigh, or if it is already bent, it should be brought as nearly straight as possible. The other measures are leeches in abundance *to* the joint, or cupping *near* it; ice, evaporating lotions, or warm poppy fomentations, according to the patient's choice; a good dose of calomel, followed by saline purgatives, till the motions are no longer dark and offensive: the treatment should be commenced by thorough purgation; then opiates at night to relieve pain. A warm poultice of camomile flowers, boiled till they are quite soft, or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[*] Sketch of a patient affected with acute synovitis of the right knee.

bran poultice, sprinkled with laudanum; or cotton wool covered with oiled silk, will generally be found more soothing than cold applications. Blisters, it need scarcely be said, are inapplicable till the acute stage is subsiding.

When the disease is manifestly connected with rheumatism—when it is attended with red sediment in the urine and acid perspirations, and affects several joints, and extends to the synovial sheaths of tendons, after due purgation, as described above, colchicum should be administered every six hours (F. 69, &c.); if this fails, iodide of potassium (F. 95), with F. 72 at bed-time; when the fever subsides, guaiacum may be given.

When there is a tendency to gout, and the patient complains of grinding, excruciating pain, as if the joint were torn asunder, the colchicum is also the main remedy. In syphilitic cases (which will be known by the patient's general history, by his wan, peculiar appearance, and most likely by the existence of papular or other eruptions, vide p. 197), mercury may be tried, if it has never before been given to excess; but if it has, or if the constitution is broken down, recourse may be had to the iodide of potassium in doses of gr. iii. ter die, with a small dose of colchicum and opium at night; and sarsaparilla or cod-liver oil should be given in abundance. F. 82, 83. In all these cases warm baths, in which a quantity of carbonate of soda or potass has been dissolved, will probably be of service.

II. CHRONIC INFLAMMATION of the synovial membrane is characterised by *swelling* of the joint, of the same nature that attends the acute form, and by a dull aching *pain*, accompanied with a sense of weakness and relaxation, and not usually aggravated by pressing the articular surfaces against each other. The swelling always comes on in a few days after the pain; and sometimes, in long-continued cases of an indolent character, it is the only symptom present: these cases are called *hydrops articuli* or *hydrarthus*. If the disease proceed, the synovial membrane and surrounding tissues may become thickened and gristly, and the swelling lose its softness and fluctuation. This constitutes probably the condition described by Sir B. Brodie, as *pulpy degeneration of the synovial membrane*; a slow thickening from deposit of unhealthy exudation, which is liable to lead to ulceration of the cartilage and destruction of the joint.

The *causes* are the same as those of the acute form, of which it may be a sequel.

Treatment.—The indications are, first, to correct constitutional disorder; secondly, to reduce inflammation; and thirdly, to produce absorption of the effusion and thickening, and restore the part to its proper uses.

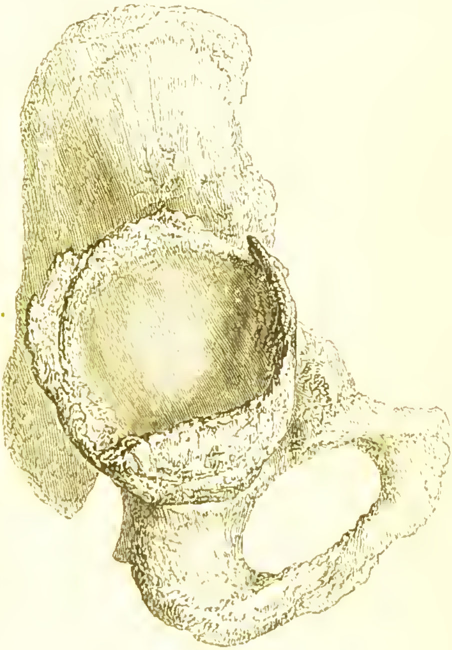
In the first place, therefore, if the complaint is constitutional, and depends on gout, it must be treated by colchicum and warm aperients, especially the decoction of aloes and alkalis. F. 70, 94, &c. If the habit is rheumatic, colchicum, or the iodide of potassium, or guaiacum, F. 56, 7, must be resorted to; and in most cases, especially those following syphilis or gonorrhœa, warm-bathing, change of air, sarsaparilla, and carefully-regulated diet will be indispensable. See Part II., Chap. VI., Sect. X.

Secondly, in cases arising from local injury; whilst there is any activity about the inflammation (especially an increase of aching pain at night), the part should be confined by a splint or starched bandage, and should be bathed with cold lotions, and blood should be repeatedly taken by leeches or cupping. Mild alteratives should also be administered, F. 63, &c.

The third indication is to be fulfilled by *counter-irritants*, beginning with blisters; which are as serviceable in the chronic as they are detrimental in the acute disease. They should be applied in succession, and be quickly healed up; and should not be put too near the joint, if it is superficial, as the knee. The strong acetum cantharidis will often be found a very convenient substitute. After the blistering, when the activity of the disease has subsided, the iodine paint; the linimentum hydrargyri; or stimulating liniments, F. 143, &c.; the *douche*, or affusion with hot water; and the vapour-bath will complete the cure. But all stimulating applications must be at once abandoned, if they cause an aggravation of heat and pain. The ointment of Scott, F. 160, the *ceratum hydrargyri comp.* of the Pharmacopœia, is one of the most useful applications for the convalescent stage of this and other chronic diseases of joints. It is applied thus: the surface of the joint, having first been washed with camphorated spirit, should be covered with the ointment thickly spread on lint; next, adhesive plaster should be evenly applied in strips, so as to form a complete casing for the joint; and lastly, a bandage. When the knee is bandaged in this way the adhesive straps should be arranged so as not to press too tightly on the patella. Supposing, *after inflammation has subsided*, the joint is left stiff,—the knee, for example, in a half-bent state—a process of very gradual extension may be set about by means of splints with a screw attached; but the greatest care must be taken not to light up a fresh inflammation.

III. Abscess in Joints.—If, after acute or chronic inflammation, a joint becomes very much distended, and there is constant pain unmitigated by remedies, and considerable constitutional excitement, suppuration of the synovial membrane may be fairly suspected. The first thing to be done under these circumstances is to make a puncture with a grooved needle, and examine the fluid that exudes. If it is serum, two or three more punctures may be made, and an exhausted cupping-glass be applied over them; and by these means the part may be very safely and expeditiously relieved of a considerable quantity of fluid. If it is pus, a free opening should be made, so that the matter may run out easily; the joint should be placed on a splint in the most easy and convenient posture: the general health should be amended by tonics, alteratives, and proper diet; and then, in favourable cases, a cure will be effected by *anchylosis*. But if the suppuration and constitutional disturbance increase, the limb must be amputated.

Purulent depôts in Joints.—It has been mentioned in several previous chapters, that a rapid effusion of puriform fluid into the joints and other parts is a frequent occurrence in puerperal fever, erysipelas, and other cases in which the blood is contaminated by a morbid poison. The part becomes red and painful, and very soon afterwards is found to be filled with pus. The only local treatment consists of a free incision in a depending position, and a splint with a bandage to prevent accumulation of matter.—See *Pyœmia.*



IV. CHRONIC RHEUMATIC ARTHRITIS (*Nodosity of the Joints*) is a disease characterised by peculiar alterations of all the tissues of one or more joints. Joint *cavities* are enlarged and made hollower. The *heads of bones* are irregularly enlarged, and flattened; with overhanging mushroom-like borders, and often a great variety of projections and pedunculated exostoses around. The *cartilage*, as we learn from Mr. William Adams, seems to take the first step in the morbid process, becoming greatly hypertrophied, and afterwards ossifying. Yet wherever it is exposed to friction, the covering of cartilage is generally worn away, leaving the bone bare, and of ivory hardness and polish — a condition depending upon a filling up of its canals and interstices with bone tissue, or at least with earthy deposits. This eburnated bone is liable to be worn into grooves, or to be worm-eaten by ulceration. The ligamentous textures are usually wasted, unravelled, or altogether absorbed. The synovial membrane thickened, vascular, and studded with innumerable melon-seed-shaped projections, fibrous, cartilaginous, or bony.

Symptoms.—The patient complains of racking pain in the affected joint, of a rheumatic, gnawing, wearing character, and sometimes rendered worse by changes of weather, sometimes by the heat of the bed at night. It is not usually aggravated by pressing the articular surfaces against each other. The joint becomes stiff; its movements limited, and often attended with an audible and sensible grating sound. The muscles around it become wasted, and the limb often shortened. When the hip is the part affected, the body is bent forwards at an acute angle with the hip; the step is short, and the power of flexing the limb on the pelvis, as in going up stairs, very limited.

In the shoulder joint, which is frequently the seat of this disease, the glenoid cavity has been found greatly enlarged, completely divested of cartilage, and surrounded with an irregular osseous growth: the glenoid ligament and long tendon of the biceps absent; so that the head of the humerus may be drawn up and play against the under surface of the acromion, which may be coated with porcellaneous substance; the head of the humerus increased in size; flattened, divested of cartilage, its cortex thin, and cancelli soft and porous, and the circumference of the anatomical neck overlaid with an irregular growth of bone; the capsular ligament generally thickened, but absorbed in certain places, and the tendons connected with it almost entirely atrophied and absent. There can be no doubt that these appearances have been occasionally mistaken for the results of injury—such as rupture of the biceps, or unreduced dislocation.

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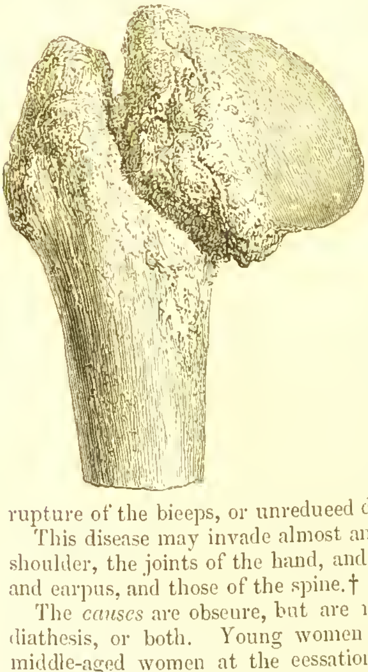

This disease may invade almost any joint, but especially the hip, the shoulder, the joints of the hand, and especially that between the thumb and carpus, and those of the spine.†

The *causes* are obscure, but are referred to the rheumatic or gouty diathesis, or both. Young women may be attacked at puberty, or middle-aged women at the cessation of the menses, or persons much exposed to cold and wet; but it is the aged who are the peculiar victims of this disease. Any blow or bruise is liable to act as an exciting cause. See *Dislocations of the Shoulder and Fractures of the Hip.*

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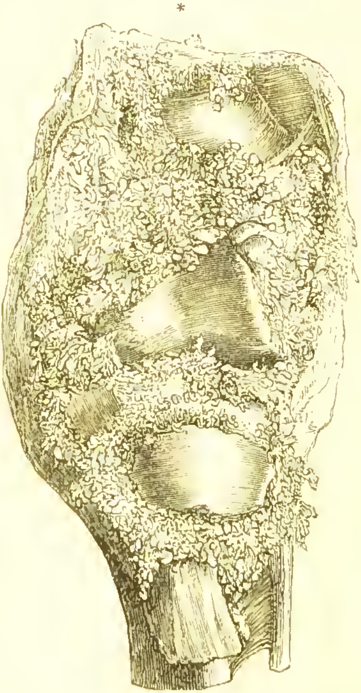
[*] This cut shows the head of a femur, the preceding one the corresponding acetabulum affected with chronic rheumatic arthritis; from specimens belonging to E. Canton, Esq.

[†] R. W. Smith, on Fractures, &c. near Joints: B. Bell, on Diseases of the Bones, 1828; Edwin Canton, Surgical and Pathological Observations, 1855; W. Adams, on Enlargement of Articular Extremities of Bones in Chronic Rheumatic Arthritis, Pathological Trans. vol. iii. R. W. Smith, on Chronic Rheumatic Arthritis of the Shoulder, Dublin Quarterly, Feb. 1853.

The *treatment*, not very successful at the best, consists in the use of warm aperients, antacids, and medicines reputed to possess anti-rheumatic virtues, such as the warm purgatives and tonics under F. 37, 38, 55, 56, 72, 73, and 7; in fact, rhubarb, beaume de vie, guaiacum, ammonia, sulphur and bark, with generous diet, opiate embrocations, flannel bandages, and warm *douches*, especially of the Bath waters. The chloride of arsenic has been recommended.

V. LOOSE CARTILAGES commence as little pendulous growths upon the synovial membrane, which become accidentally detached. They occur most frequently in the knee.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Symptoms.—They can be felt when they present themselves at the surface of the joint; and when they get between the ends of the bones, which they are very apt to do during exercise, they cause sudden excruciating pain and faintness, followed by inflammation.

Treatment.—If possible, the loose body should be fixed by bandages, so as to prevent it from getting between the bones, otherwise it must be removed by subcutaneous incision, a plan which seems to have been proposed almost simultaneously by Mr. Syme of Edinburgh and M. Goyraud, and which avoids the danger of a direct wound into the joint. The cartilage is to be pushed up as high as possible into one of the synovial pouches by the side of the patella, and a long narrow knife is passed down upon it through the skin two or three inches above, and made to divide the synovial membrane to such an extent that the cartilage may be squeezed through into the subcutaneous cellular tissue, but without enlarging the wound in the skin. There the cartilage must remain till the wound in the synovial membrane has had time to heal; and then it may, if desired, be easily removed by an incision through the skin; but if it causes no inconvenience it may be allowed to remain.†

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* Knee-joint opened, patella turned down, synovial membrane studded with melon-shaped growths. St. Mary's Museum.

† See B. and F. Med. Review, vol. xi. p. 526, and Fergusson's Practical Surgery, p. 321.

SECTION II.—THE LIGAMENTS.

I. INFLAMMATION.—Authors have described a form of inflammation of the ligaments of joints characterised by great pain from motions that shake, or twist them.* It must be treated like subacute rheumatism.

II. RELAXATION.—If any joint have been long disused, and especially if its innervation be impaired, its ligaments are liable to become relaxed and elongated, so as even to permit the dislocation of the bones to which they are attached. Thus, in a case related by Mr. Stanley, which followed an attack of hemiplegia, the ligamentum teres and capsular ligament of the hip were so elongated as to permit the head of the femur to slip out of the acetabulum. A similar result may ensue from long-continued chronic synovitis or rheumatism. Mechanical support, blisters, friction, cold affusion or sea-bathing, and electricity, are the only available remedies.† Slighter degrees of relaxation occurring to weakly children may be cured by good diet, tonics, and friction.

SECTION III.—THE CARTILAGE.

I. THE DISEASES of articular cartilage have been particularly studied by Professor Redfern of Aberdeen, who has shown that any disturbance whatever of their nutrition by injury or disease, produces one and the same change in their structure; viz., that the cartilage cells enlarge, become crowded with corpuscles, and lose their cell-wall; so that the contained corpuscles are either mingled with the intercellular tissue, or else are discharged on the surface of the cartilage, if near it. Meanwhile the intercellular or hyaline substance softens and becomes fibrous.‡

II. THE REPARATION of cartilage after injury or disease is effected by the conversion of the softened intercellular substance into white fibrous tissue, and of the nuclei that have escaped from the cells into yellow fibres, which together form a cicatrix.

III. ULCERATION of cartilage consists in the progressive disintegration of the softened hyaline substance, and in the bursting of the cells and discharge of their contents. The pathological importance of this morbid process has been very much diminished by the discovery that it may exist to a considerable extent, even in the knee-joints of persons accustomed to bear heavy burdens, without any symptoms whatever. The cartilage may also, whilst preserving its healthy structure, wear away gradually in old men and animals, till it leaves the bone quite bare: the latter becoming dense, smooth, and polished,* yet with no symptoms except a slight grating. Ulceration of cartilage may occur as the result of any severe disease of the synovial membrane or of the bone. But it appears that it may exist by itself, without any disease of the other joint textures, and without any symptoms. It seems, therefore, that whatever grave importance may be attached to this process belongs really to the disease of bone, or of synovial membrane which accompanies it.

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* Mayo's Pathology, p. 79.

† See six cases of dislocation from this source, narrated by Mr. Stanley in Med. Chir. Trans. vol. xxiv.

‡ P. Redfern, M.D., on Anormal Nutrition in Articular Cartilage, Edinburgh, 1850; and on the Healing of Wounds in Articular Cartilage, Edinburgh Monthly Journ. Med. Sciences, Sept. 1851.

SECTION IV.—SCROFULOUS DISEASE OF JOINTS, WHITE SWELLING, AND ARTICULAR CARIES.

I. IN THE ADULT.—In persons of unsound constitution, any neglected injury or inflammation of any one of the joint structures is liable to lead to total and irreparable disorganization of the joint; including complete ulceration or destruction of the cartilage, caries of the bones, conversion of that part of the synovial membrane which lines the ligaments into a yellow gelatinous substance; softening and ulceration of the ligaments; and conversion of all the tissues around the joint into a gelatinous substance, riddled with abscesses, in which all natural distinction of structure is lost.

This condition may be produced in the scrofulous adult by an insidious idiopathic disease, which was formerly called *chronic ulceration of cartilage.*

Symptoms.—For the first few weeks (or perhaps months) of this disease the patient complains only of slight occasional rheumatic pains, perhaps flying about and affecting several joints, but at length settling decidedly in one. After a time, the pain increases in severity, especially at night, and it is generally referred to one small spot, deep in the joint, and is compared by the patient to the gnawing of an animal. Moreover, it is usually accompanied by an aching of some other part of the limb: thus, when the hip or elbow is affected, there is an aching of the knee or wrist; but it is important to notice that both the pain in the affected joint and the sympathetic remote pain are always aggravated by motion of the joint, and by pressure of the articular surfaces against each other. As the disease proceeds, the suffering becomes most excruciating, and is attended with painful spasms and starting of the limb during sleep; so that the patient's rest is broken, his spirits exhausted, and his appetite and general health rapidly impaired. At first the pain is unaccompanied with any swelling; in fact, this symptom never appears in less than four or five weeks, and often not for as many months, and when it does appear it is slight; and as it depends on an infiltration of the tissues *around* the joint, and not on effusion *into* it, the shape of the joint is unaltered.

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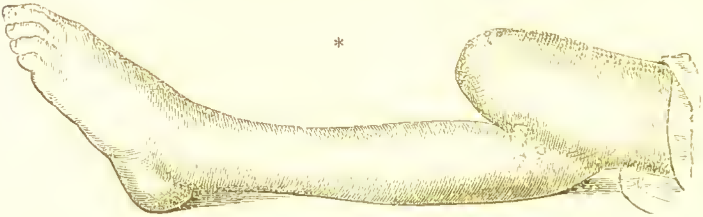
* This change is said to occur in the astragali of old draught horses, without occasioning any inconvenience to the animals. Richet, Brit. and For. Med. Rev., Jan. 1846. Mr. Quekett, quoted in Canton, op. cit. See also William Adams, op. cit.

Terminations.—In fortunate cases, that are subjected to judicious treatment at an early stage, the disease may be arrested, and the patient recover with a stiff or anchylosed joint; but in unfavourable cases, the cartilage is entirely destroyed; the bone can be heard to grate on the least motion; suppuration occurs into the joint, and numerous tortuous abscesses form around it; the surrounding soft parts are disorganized; the ligaments are destroyed, so that the flexor muscles, which have long kept the joint immoveably bent, at last dislocate it: if the knee is affected, for instance, the head of the tibia is drawn backwards into the ham, as in the foregoing sketch; and at last the patient, unless relieved, dies exhausted.



II. IN CHILDREN, and in some adults, the disease may begin very insidiously; with slight lameness or *weakness*, as it is called, of the limb, and wasting of the muscles, and very little pain except after exercise. Then succeeds a swelling of the joint, and of all the textures round it; with increased wasting of the limb, and flexion and distortion of the joint. This may be followed by abscess.

Pathology.—The most essential circumstance to be regarded in this disease is the constitution. Whether in adults or in children, this is sure to be of a debilitated scrofulous sort. Regarding the local changes, they may commence in the synovial membrane; 2, in the cartilage; 3, in the bone; 4, in the parts around.

1. Acute or chronic synovitis, especially if the result of injury, in a person of bad constitution, will very frequently cause destruction of the cartilage, and caries of the bone, suppuration in the joint, and the other train of symptoms just described. This case will be known by the swelling from effusion into the joint in the early stage.

2. Whether ulceration of the cartilage alone, without morbid change in the bone or synovial membrane, is capable of giving rise, as is commonly supposed, to the disease just described above, must, after Dr. Redfern's researches, be considered doubtful. It is more than probable that some morbid state of the bone, or of the synovial membrane, or of both, accompanies it from the first.

3. In the case of scrofulous children, it seems pretty certain that the disease commences with caries of the cancellous texture of the articular

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* Sketch of diseased knee, from a patient of Dr. Paul's, at Camberwell House Asylum. The tibia and fibula dislocated backwards.

extremity of the bone. The affected bone is found to be soft, red, and easily crushed; its cancelli are filled with a reddish granulation, sometimes with inspissated pus, or tubercle. Owing to this softened state of the bone, the cartilage peels off from it readily. When peeled off, its under surface is probably found ulcerated; and between it and the bone there is a small quantity of highly-vascular lymph growing out of the carious cancelli. When the cartilage is perforated, inflammation and suppuration ensue in the joint; abscess bursting outwardly follows. In some few cases, from the rapidity of the caries, the cartilage is detached *en masse;* and sometimes necrosis of a small portion of the bone ensues.

This disease most frequently affects the knee, elbow, and small bones of the carpus and tarsus; it is very common in scrofulous children, but rare after thirty. An advanced stage gives rise to what was formerly called *spina ventosa;* that is, the extremity of the bone becomes greatly enlarged by superficial deposits, but is hollowed out into a mere shell by caries in its interior.

The *prognosis,* in the first stage, that is, before swelling has occurred, may be favourable; but after swelling has existed for some time, the patient will be fortunate in recovering with anchylosis; and after suppuration, he will, if an adult, be almost certainly compelled to suffer excision.

4. In some instances, as the author has seen in practice, a joint may be disorganized through the presence of scrofulous exudation and suppuration into the *areolar tissue* contiguous to it. This case requires no particular observation, except that any suppurating spot should be opened early.[†]

Treatment.—If there be much pain, the first and most indispensable measure is *perfect rest;* which must be insured by confining the joint with a starched bandage (not too tight) or splint of gutta percha, or of thick leather softened in hot water, accurately moulded to the part, and then lined with flannel. The use of splints is two-fold. First, to prevent deformity; secondly, to insure rest. But we do not intend to say that every patient with scrofulous disease of knee, or hip, or ankle,

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[*] This cut exhibits caries of the astragalus, with incipient separation of the cartilage. From the King's College Museum. The next shows a state approaching to *spina ventosa.*

[†] This kind of affection was particularly described by Mr. Wickham on Diseases of Joints, p. 84. See also Coulson on Hip Joint, p. 85; and South's Chelius, vol. i. p. 210.

should be kept absolutely at rest during the whole course of the disease; on the contrary, during the convalescent stage the patient may go out on crutches with the joint bandaged, and the leg supported by a sling round the neck, so as to get fresh air and exercise; provided always that no *pain* is occasioned. 2. Occasional *leechings* may be used in the early stages, when the pain is severe. But loss of blood is merely a palliative of accidental fits of inflammation, and cannot possibly remove tubercular deposits. 3. *Counter-irritation* either by a seton, or caustic issue, or the actual cautery, is a measure which was more in repute formerly than it is now; the cases in which it is most serviceable are the very painful joint ulcerations of adults; to scrofulous children it is more likely to be hurtful than advantageous. If the knee is affected, a small caustic issue may be established on each side of the head of the tibia, and may be kept open by an occasional touch with caustic potass, or sulphate of copper. The actual cautery is exceedingly efficacious as a counter-irritant, and the patient may be rendered unconscious of it by chloroform.* Sir B. Brodie has shown that issues, when long established, sometimes irritate the constitution, bringing on a return of the pain which they relieved at first, and which will again depart if they are healed up. It is a practical rule, therefore, to give them up for a time, before condemning a joint to excision. For children, if counter-irritation is deemed necessary, blisters answer very well. 4. The ointment of Scott, applied as described in a preceding page, will often be found a useful auxiliary to time and quietude. 5. *Mercury* given so as gently to affect the system, is believed by Sir B. Brodie to be of great benefit in the case of adults.† 6. In other cases, the treatment must be that which we have prescribed for scrofula: cod-liver oil; iodide of iron or of potassium: sarsaparilla; nutritious food; and sea-air, so soon as the patient is able to go out. Pain must be allayed by hemlock or opium. 7. There can be no doubt that recovery is often prevented by the presence of pus, and of the débris of bone and cartilage in the cavity of the joint. When suppuration, therefore, has taken place, it seems rational not to let the matter burrow and establish sinuses, and disorganize the surrounding textures, but to adopt Mr. Gay's plan, and freely lay open the cavity by longitudinal incisions. Thus, a free exit being provided

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* Refer to the Index.
† Lectures, Med. Gaz., vol. xxxvii.

for discharge, the parts will be relieved of one obstacle to recovery. Besides, weak injections of iodine, dilute nitric and phosphoric acid, and other applications, may be made to the diseased surfaces, and carious or necrosed portions of bones be removed. 8. If all other measures prove unavailing, and the health is sinking, the diseased articular surfaces should, if possible, be cut out; otherwise, the limb should be amputated.

SECTION V.—ANCHYLOSIS.

ANCHYLOSIS signifies a fusion or union of the ends of bones, and is a frequent consequence of serious injuries and diseases of joints; therefore, whenever it is likely to happen, the affected joint should be placed in the position which will be the least inconvenient for it to preserve. The elbow should be placed at a right angle; the wrist straight; the hip and knee a very little bent; and the ankle at a right angle to the leg. There are three varieties of anchylosis:—

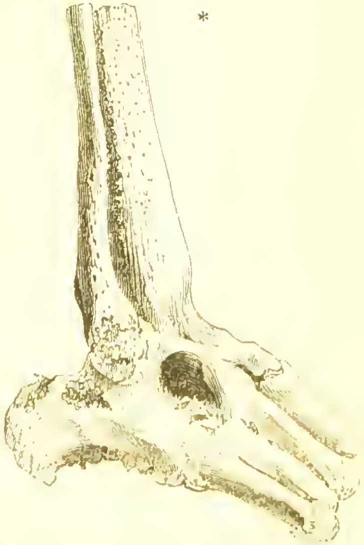
Moreover, in almost every case of diseased joint, unless the surgeon is on his guard to prevent it, the patient will put it into a bent position, in which it will remain till the extensor muscles are almost paralyzed, and the flexors shortened and inextensible. The continued traction of these muscles aid in disorganizing the joint and dislocating one bone from another, as is constantly seen in disease of the knee and hip.

1. The *spurious* or *false* anchylosis, which depends on thickening of the synovial membrane, and organization of bands of adhesion around the joint, gluing the various structures to the skin and to each other.

2. *Ligamentous* anchylosis signifies the union of two articular surfaces by fibrous tissue; and some degree of it almost inevitably follows in any case in which recovery takes place, after destruction of cartilage.

3. *Bony anchylosis* results when fibrous tissue so produced ossifies.

Treatment.—It is very evident that nothing ought to be done until all diseased action has ceased, and the parts have returned to a quiescent state. Then measures may be taken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* This cut shows the results of long-continued disease of the ankle joint. The bones are completely *welded* together by bony anchylosis.

for restoring the power of motion. 1st. There is the category of slow and gentle measures, consisting of *passive motion*, combined with friction, shampooing, and local steam-baths. By passive motion is meant, that some person shall take the affected limb and gradually bend and extend the stiff joint with just force enough to cause a little yielding, and little or no pain. A screw, fitted to a splint with a hinge in it, may also be used for the purpose of gradually straightening out the joint.

2ndly. A more active set of proceedings consists in dividing, by subcutaneous section, the tendons of any muscles, or any fascia, or even any muscular fibres, whose rigidity is an obstacle (see *Tenotomy*). Immediately after this operation, pressure should be applied to prevent bleeding, and the wound should be allowed to heal. Then a fresh attempt may be made under chloroform; and if it can be done without too great violence, the joint may be forcibly extended so as to tear through bands of fibrous tissue in or around the joint. At the same time any degree of subluxation or displacement may be rectified. After the operation, the limb must be put up in an easy posture on a splint, and the case be treated like a recent strain, till inflammation has subsided; then gentle passive motion will probably entirely restore the use of the limb after some weeks of treatment.*

When the knee-joint is concerned, the hamstring muscles, and portions of fascia, may probably require division. If the elbow, the aponeurotic offshoot of the biceps. The knee may be straightened by pressure; the elbow likewise by main force. The pectoralis major, latissimus dorsæ, teres major and minor were divided by Dieffenbach to effect reduction of an old dislocation of the shoulder; and the pectinæus and sartorius by an American surgeon in a case of contracted hip.

3rdly. If the anchylosis is bony and extensive, there is no resource except to saw through the bone, or cut out a wedge-shaped portion, and then employ sufficient motion to establish a false joint. This operation was successfully performed by Dr. Rhea Barton, of Philadelphia, on the hip in 1827, and on the knee in 1838. It was also successfully performed by Dr. Gibson, of Philadelphia, in a case of complete anchylosis of the knee, with not a vestige of ligament, cartilage, or synovial membrane remaining. Having laid bare the front of the joint by a V incision above the patella, he sawed out a wedge-shaped portion of the bone, and gently bent the rest so as not to endanger the popliteal vessels.† But of course this is so serious an operation, that it must not be undertaken without balancing the advantages with the risks of it. Moreover, before having recourse to it, the surgeon should try fairly whether the joint can be bent by main force; for it need scarcely be said that the rupture of any amount of fibrous tissue, or fracture of bony tissue without wound of skin, is a very much safer proceeding than the making a deep wound involving the bone.

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* See paper by Mr. Brodhurst on Forcible Extension and Rupture of uniting medium of partially anchylosed surfaces. Med. Chir. Trans., vol. xl.

† Vide American Journ. Med. Sc., July, 1842, and a case by Dr. Buck, Ranking's Abstract, vol. iii. For further information, consult Fergusson, op. cit.

SECTION VI.—DISEASE OF THE HIP-JOINT, OR MORBUS COXÆ.

This joint is exceedingly liable to chronic disease, and there are certain peculiarities in the symptoms which render it expedient to devote a section to it in particular. It is uncertain whether scrofulous caries of the head of the femur, or whether ulceration of the synovial membrane and cartilage, is the primary morbid change; but the symptoms and ulterior consequences are nearly the same in either case.

Symptoms.—The disease begins with slight occasional pain, and more or less stiffness and weariness in the joint, and lameness in the gait. As it advances, the pain becomes very excruciating in the cases of ulceration of cartilage, whilst in those of scrofulous caries it is comparatively trifling; but in both forms it is felt chiefly in the knee; and in the scrofulous caries, the pain in the knee may be the only symptom complained of; nay, there may even be some swelling there. The criterion, however, is, that if the surgeon presses on the hip-joint, either in front over the psoas and iliacus, or behind the great trochanter, or if he jerks the femur upwards against the acetabulum, pain will be felt in the hip, and the pain in the knee will be greatly aggravated.

After these symptoms have gone on increasing for a variable time, the nates become wasted and flabby, and the whole limb weaker; and it is noticed that the affected limb is, or appears to be, longer than the sound one, a lengthening which possibly may depend in some slight degree on effusion into the synovial membrane, and protrusion of the trochanter; but much more probably is caused by the patient's habit of standing with his weight supported entirely on the sound limb, and of lowering the diseased side of the pelvis, and stretching out the diseased leg to steady himself with. Sometimes, instead of being lengthened, the limb is apparently shortened, as shown in the following cut (Fig. 1), which gives a bird's-eye view of a child, a patient of Mr. Partridge's, in the King's College Hospital. This apparent shortening is caused by muscular action, and by the patient's endeavours to throw the limb into an easy posture; it varies from time to time, and is not to be seen in all cases.

But if the disease proceed, there comes another kind of shortening, caused either by absorption or by caries of the neck of the femur, or by the destruction of the acetabulum and capsular ligament and dislocation of the bone upwards by the muscles. The deformed appearance caused by this dislocation is well exhibited in the following sketch (Fig. 2), taken from a patient under the care of Mr. Fergusson, in the King's College Hospital; it also shows the apparently broad and large, but really wasted and flattened form of the nates. The effect of the altered length of the limb in distorting the spine is also seen. Sometimes the limb is turned inwards, as in dislocation on the dorsum illi; or outwards, as in fracture of the neck of the femur: this is accidental. This organic shortening is usually attended with an increase of the pain, and of the starting of the limb during sleep, and is in most cases (but not all) soon followed by abscess, which may burst on the nates or the groin, or may burrow between the muscles of the thigh; or the acetabulum may be perforated, so that the matter passes into the pelvis and bursts into the rectum. From this suppuration stage it is exceedingly rare for an adult to recover, although, in the case of children, the prognosis is not unfavourable, if the strength is pretty good, and the lungs free from disease; and the patient may be so fortunate as to recover with an anchylosed hip. The duration of the disease may vary from two or three months to several years.

Fig. 1.

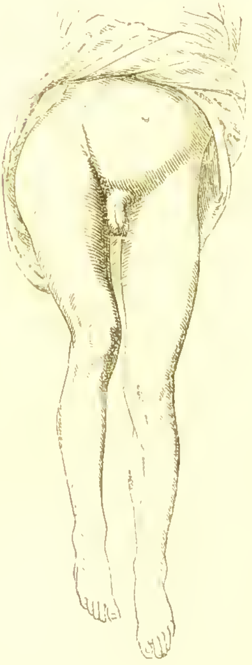
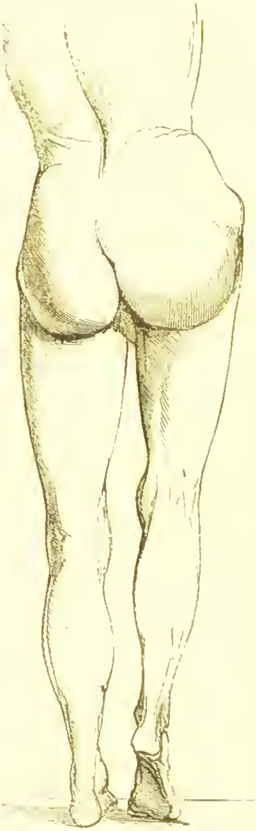
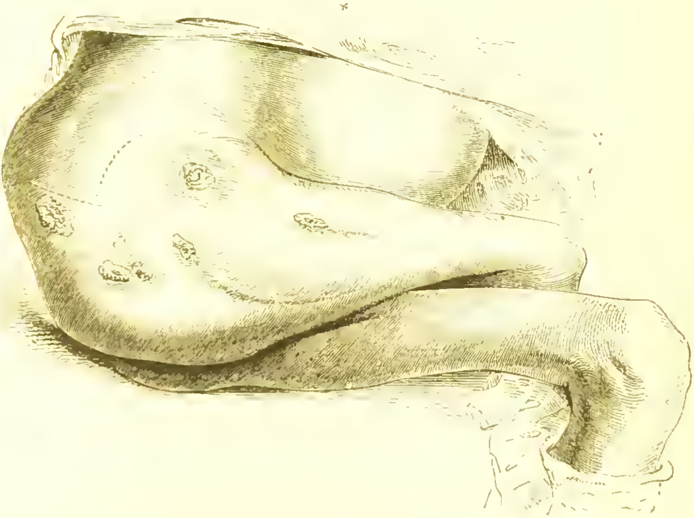


Fig. 2.



Diagnosis.—From *psoas abscess* it may be distinguished by the absence of pain in the back. From *chronic rheumatic arthritis*, by the history of the case, the age of the patient, the absence of audible crepitation, and by the pain caused by pressing the articular surfaces against each other; which is not a character of the chronic rheumatic affection. Yet it must be remembered that this latter disease may lead to abscess if the patient meets with injury. The great pain caused by pressing the femur against the acetabulum will distinguish this disease from *sciatica.*

Treatment.—This must of course be the same in principle as the treatment of other diseased joints. If the patient comes under treatment in the earliest stage, the limb should be maintained at *perfect rest in the straight posture*, by means of a straight splint reaching from the axilla to the foot. If distortion has already commenced, a bandage of leather or pasteboard should be applied; and the patient should not be permitted to lie constantly on the sound side, else the distortion of the spine and the chance of dislocation will be enhanced. Cupping or leeching, if there is considerable pain and tenderness, with strength sufficient, will be of great service in the early stages, and a grain of grey powder with henbane be given nightly. F. 63, 64. But the principal dependence is to be placed on cod-liver oil and tonics, and on counter-irritation by means of an issue behind the great trochanter, or at the anterior edge of the tensor vaginæ femoris, or by a seton in the groin; and these measures should not be neglected, even though suppuration



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[*] Sketch of the patient from whom Mr. H. Smith removed the head of the thigh bone. It illustrates the extraordinary attitudes which patients are liable to acquire. The dotted lines show the course of Mr. Smith's incisions.

has commenced. When abscess forms, it should be opened subcutaneously, so as not to let the air enter the cavity as the pus escapes.

The *position* of the patient in bed is a point of considerable importance, since if left to himself he is apt to acquire the most distorted and ungainly attitude. "The following contrivance," says Mr. Coulson, "will be found very useful;—a double-inclined plane should be formed by joining two portions of wood together in such a manner that when the child's hams are made to correspond with the angle of junction, his legs and feet should extend down one plane, and there be confined to the foot-boards by rollers, whilst his thighs and buttocks extend down the other. The foot-boards will also have the beneficial effect of removing the weight of the bed-clothes from the feet. Opposite the anus a small opening should be made to admit the passage of the fæces. The whole trunk of the child should lie quite horizontally on the bed."

The *prone position* is recommended by Coulson in the latter stages, as it avoids pressure on diseased and ulcerated hips; it allows dressings to be readily applied, and counteracts the patient's habit of lying with the diseased limb drawn up across its fellow. A couch is constructed with an angle, corresponding to the bend of the hips; it has one part horizontal on which the abdomen and chest repose, while the pelvis and legs hang down an inclined plane.

In cases in which a carious head of the femur has been lying out of its socket for some time, keeping up constant irritation and discharge, with no chance of benefit from ordinary local or constitutional remedies, whilst the acetabulum and bones of the pelvis, as well as the lungs, kidneys, and other viscera are free from active disease, *excision of the head of the femur* may be proposed.

This operation was first performed by Mr. Anthony White in 1821, with perfect success, although Sir E. Home and the medical officers of St. George's Hospital gave it as their opinion that it would be useless, impracticable, and fatal. It was revived by Professor Fergusson in 1845, and has since that time been performed not only by that gentleman, but by Mr. Simon, Mr. H. Smith, Mr. French, Mr. Haynes Walton, Mr. Cotton of Lynn, Mr. Morris of Spalding, Mr. Jones of Jersey, and Professor Buchanan of Glasgow, and with such an amount of success that it may now fairly rank amongst the established operations of surgery; and it is a strong argument in its favour that the acetabulum, although originally involved in the disease, yet frequently sets up a process of repair, and becomes filled with fibrous membrane, so soon as it is relieved by dislocation from the presence of the carious head of the thigh-bone. It is not a difficult proceeding. An incision five or six inches in length is made over the diseased and displaced bone; another at right angles across the trochanter; the soft tissues are cleared away from the bone (they consist of little more than skin and cellular tissue, for the thick muscles which cover the part in health are long since wasted), the saw is applied below the trochanter, and the head of the bone with that process removed. The adjoining cut shows the portion of bone removed by Mr. H. Smith. After the operation the limb must be brought into the straight position, and be kept at rest by means of a long splint, and the case be treated on general principles.

If everything goes on well, the patient will recover a useful limb with a considerable degree of motion at the hip, and can walk comfortably with a high-heeled shoe.*

SECTION VII.—NEURALGIA OF JOINTS.

The characters of neuralgic pain, as distinguished from that which accompanies organic disease, have been described under the head of Hysterial Neuralgia (see p. 11); but we introduce this short section in order to remind the young surgeon of the possibility of mistaking hysterical pain for ulceration of a joint.

SECTION VIII.—WOUNDS OF JOINTS.

Symptoms.—A wound may often, but not invariably, be known to have penetrated a joint, by the escape of synovia, in the form of small oily globules.

Treatment.—The object is to avert acute inflammation of the synovial membrane, which might prove fatal. If the knee be the part wounded, and there is comminuted fracture of bone or great loss of skin, excision may be requisite; if, besides, the popliteal artery be wounded, amputation. Otherwise, the wound should be carefully closed and covered with a piece of lint dipped in blood. The limb should be comfortably bandaged, and the joint be kept quite motionless on a splint; and every local and constitutional measure be adopted to avert or subdue inflammation.

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* Coulson, op. cit.; O'Beirne and Bellingham, on the use of Mercury in early stages, quoted in Ranking's Abstract, vol. x. p. 290; Fergusson's Surgery, 3rd edit. p. 469; Henry Smith, Essay in Lancet, 1848, vol. I. p. 361; Syme, Lancet, 1849, vol. i. p. 266 (*objects to the operation*); Cotton's case, Med. Gaz., 1849; case by Skey, Med. Gaz., Aug. 31, 1850; sequel to Fergusson's case by Smith, Med. Times, Dec. 4, 1852.

SECTION IX.—DISLOCATION OR LUXATION, GENERALLY.

Symptoms.—The symptoms of dislocation are two:—1. *Deformity:* there being an alteration in the form of the joint; an unnatural prominence at one part and a depression at another, together with lengthening or shortening of the limb. 2. Loss of the proper motions of the joint.

Causes.—Dislocation may be caused by external violence, or by muscular action. And the circumstances that enable muscular action to produce it are,—a peculiar position (as when the jaw is very much depressed); paralysis of an antagonist set of muscles; elongation of ligaments; or fracture or ulceration of some process of bone. Thus, ulceration of the acetabulum permits the head of the femur to be dislocated upwards, and fracture of the coronoid process permits the ulna to be dislocated backwards.

Morbid Anatomy.—Dislocation is almost of necessity attended with some rupture of ligaments, which, however, readily unite and heal. If the dislocation be left unreduced, the lymph thrown out around the head of the bone in its new situation becomes converted into new ligaments, and into a new socket, which is lined with a smooth ivory substance, and not with cartilage; and a very useful degree of motion is often acquired. Meanwhile the old socket gradually becomes filled up.

Diagnosis.—Dislocation may be distinguished from fracture. 1. By the *absence of crepitus.* For although a slight *crackling* is often perceptible, owing to an effusion of serum into the cellular tissue, it can hardly be mistaken for the *grating* of fracture. 2. By the circumstance that the surgeon can move a fractured bone more freely than is natural, and a dislocated one less so. 3. By *measurement* of the bone supposed to be broken, which, if broken, will be most probably shortened. 4. If a fractured bone be drawn into its proper shape, the distortion will return so soon as the extension is discontinued; if a dislocated bone be drawn into its proper place, it will remain there.

Treatment.—The reduction of dislocations is to be effected by getting the head of the displaced bone into such a position that the muscles may draw it into its socket. Sometimes this may be done by *manœuvring*, as in certain ways of reducing dislocated shoulders and hips, that will be presently described; sometimes main force must be used; the socket being fixed on one side, and the bone pulled on the other till the resistance of the muscles is overcome. The extension should be made in such a position as to relax as many of the opposing muscles as possible, and should be aided by gentle rotation and such other movements as may help to dislodge the dislocated part. After reduction, leeches, fomentations, and purging, must be used, if required, to prevent inflammation, and the joint should be kept at rest till any laceration of its ligaments may have healed, otherwise the dislocation may be perpetually recurring.

Dislocations should always be reduced as quickly as possible, before the patient has recovered from the shock of the injury, and before the muscles have had time to contract and fix the bone in its new situation. The patient should be put under the influence of chloroform, in order to prevent involuntary resistance of the muscles; a much safer thing than the bleeding, the half-grain doses of tartar-emetic, and the hot bath, that were formerly prescribed.

COMPOUND DISLOCATION is a dangerous accident, because of the acute synovial inflammation, rapid ulceration of cartilage, and violent constitutional disturbance, with which it is liable to be followed. The necessity of amputation will depend on precisely the same contingencies as in compound fracture:—old age; bad constitution; shattering of the bone; extensive bruising or laceration of the integuments, so that the wound cannot be closed; laceration of large blood-vessels; or if it be the knee-joint. If the limb is to be saved, the dislocation must be reduced; if the end of the bone protrude through the skin, and render reduction difficult, it must be sawed off, or the aperture must be slightly dilated; the wound must then be closed, and covered with a piece of lint dipped in blood; and the case be treated as a wounded joint.

DISLOCATION AND FRACTURE.—Supposing the femur or humerus to be dislocated and fractured also, Sir A. Cooper directs the fractured part to be first well secured in splints and bandages, and then the dislocation to be reduced without delay. Because if the dislocation is not attended to till after the fracture has united, the difficulty of reducing it will be very much increased through the lapse of time; and, perhaps, the bone may be broken again during the forcible extension that will be necessary.

CONGENITAL DISLOCATION is the result of original want of development, or of intra-uterine disease, and is mostly incurable.

SECTION X.—PARTICULAR DISLOCATIONS.

1. DISLOCATION OF THE JAW may be caused by a blow on the chin, when the mouth is wide open, or by spasm of the pterygoid muscles, by which the articular condyles are drawn over the transverse root of the zygomatic process.

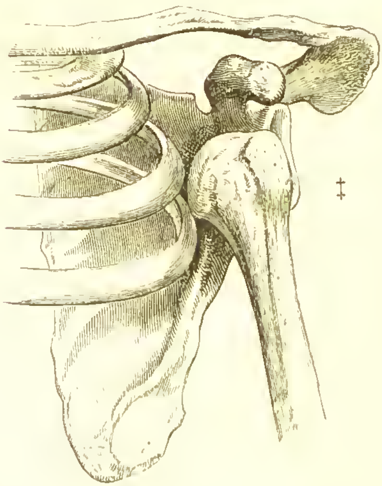
Symptoms.—The mouth fixedly open, the patient unable to shut it; speech and deglutition almost impossible; saliva dribbling away; the chin protruding forwards; and the condyle felt to project unnaturally under the zygomatic process, whilst the finger sinks into the parotid space. If one side only is dislocated, the chin will be turned towards the opposite.

Treatment.—The surgeon should first fix the head carefully against a wall, or high chair; next, wrap a napkin round his thumbs, and place them at the roots of the coronoid process behind the molar teeth; then he should press them downwards and backwards, elevating the chin at the same time with his fingers. Or he may place the handle of a fork on the last molar teeth, and depress them with it, using the upper teeth as a fulcrum. Or a piece of cork may be put between the molar teeth in order to act as a fulcrum, whilst the chin is elevated. After reduction, the chin must be confined for a week or two by a *four-tailed bandage*.

II. Dislocations of the Clavicle.—The *sternal extremity* of this bone may be dislocated *forwards* by blows on the shoulder. It can readily be felt on the anterior surface of the sternum. The *treatment* is in all respects the same as for fractured clavicle. Dislocation of this end of the bone *backwards* has been caused by curvature of the spine. In one case it produced so much pressure on the œsophagus as to threaten starvation, and was in consequence extirpated by Mr. Davie of Bungay. There are also a few cases on record of dislocation of this end of the clavicle backwards by violence. Pain and difficulty of breathing are the consequences; the reduction and subsequent treatment the same as for the dislocation forwards.*

The *outer extremity* of the clavicle may be dislocated *upwards* on the acromion. The shoulder is sunken and flattened, and on tracing the spine of the scapula, the end of the clavicle can be felt upon the acromion. The outer extremity of the clavicle has also been known to be dislocated *under* the acromion by a kick from a horse on the shoulder.† The treatment is the same as for fracture of the clavicle.

III. Dislocation of the Shoulder-Joint may occur in three principal directions. The head of the humerus may be thrown downwards, forwards, or backwards; besides which, it may be partially dislocated forwards and upwards.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1. In the dislocation *downwards or into the axilla*, which is the most common, the head of the bone rests on the axillary plexus of nerves, between the subscapularis muscles and the ribs.

Symptoms.—The arm is lengthened; a hollow may be felt under the acromion, where the head of the bone ought to be; the shoulder seems flattened; the elbow sticks out from the side, and cannot be made to touch the ribs;

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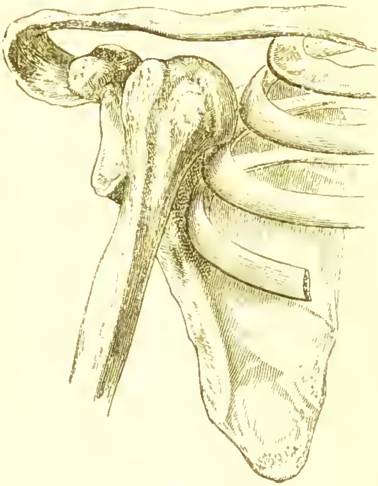
* Vide a case by M. Pellieux in the Revue Médicale, Aug. 1834, p. 151, and another by Mr. Brown of Callington, Med. Gaz., Aug. 1, 1845.

† Forbes's Rev., vol. vi.

‡ Dislocation of the shoulder downwards.

and the head of the bone can be felt in the axilla, if the limb be raised; although such an attempt causes great pain and numbness.

Diagnosis. — There are three fractures liable to be mistaken for this dislocation, viz., fracture of the *acromion;* of the *neck of the scapula;* and of the *neck of the humerus.* The first two may be known by the facility with which the form of the joint is restored by raising the limb, and by the crepitus felt on doing so. In fracture of the *cervix humeri,* the limb is *shortened,* instead of being lengthened as it is in dislocation there is not so much vacuity under the acromion; and the rough angular end of the shaft may be felt in the axilla instead of the natural smooth head of the bone.



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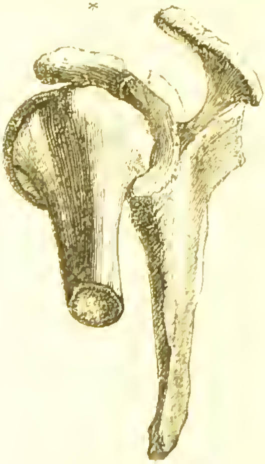

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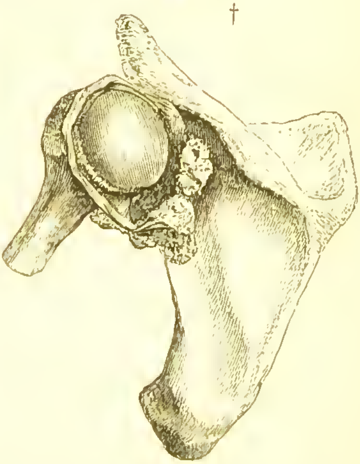


* Partial dislocation unreduced. Head of humerus under coracoid process; the head of the bone and part of the glenoid cavity are worn away. St. Mary's Museum.

† Unreduced dislocation on the dorsum. A new socket formed. St. Mary's Museum.

2. In the dislocation *forwards*, the head of the humerus is thrown on the inner side of the coracoid process, and may be felt under the clavicle.

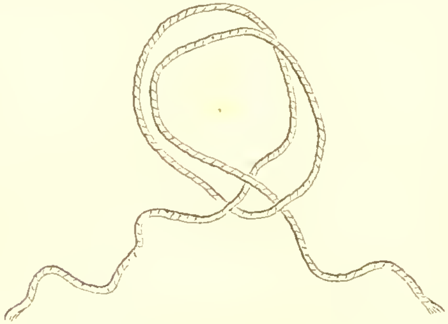
Symptoms.—The arm is shortened; the elbow projects backwards; the acromion seems pointed, and the head of the bone cannot be felt under it.

3. In the dislocation *backwards*, the head of the bone may be felt on the dorsum scapulæ; and the elbow projects forwards.

4. In the *partial dislocation forwards*, the head of the bone is thrown partly off from the glenoid cavity against the coracoid process. The symptoms are, projection of the acromion and a hollow under it at the back of the joint, whilst the head of the bone is prominent in front, and may be felt to move on rotating the elbow; cramps of the hand; and difficulty of raising the elbow, because the head of the bone strikes against the coracoid process.

Treatment.—There are five methods of reducing the first or downward form of dislocation.

1. By *simple extension.* A jack-towel is to be passed round the chest, both above and below the shoulder, so as to fix the scapula well: this should be held firmly. Another should be fastened round the arm, above the elbow, by means of the knot called the *clove hitch*, represented in the annexed figure. Extension should then be made by the latter; the patient sitting on the floor, his elbow being bent, and the humerus being raised and carried forwards, so as to relax the deltoid, supraspinatus, and biceps muscles. When extension has been made for some minutes, the surgeon should lift the head of the bone, and it will frequently return with a snap.



2. The extension may be performed in the same direction with the aid of the *pulleys;* recollecting always that they are not to be used in order to exert *greater force*, but to exert it *more equably*. A damp bandage should be applied round the elbow, to protect the skin before the strap of the pulleys is attached.

3. By *the heel in the axilla.* The patient lies down on a bed, and the surgeon sits on the edge. He puts his heel (without his boot)*

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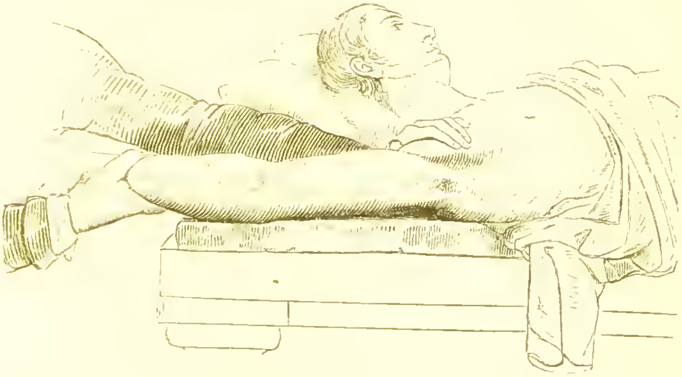
* A case is related by Dr. Warren, of Boston, in which a person made a violent attempt to reduce a dislocation by putting the heel of his boot into the axilla. The result was a rupture of the axillary artery. Vide Ranking's Abstract, vol. iii. p. 43.

into the axilla, to press the head of the bone upwards and outwards, and at the same time pulls the limb downwards by means of a towel fastened round the elbow.

4. By the *knee in the axilla.* The patient being seated in a chair, the surgeon places one of his knees in the axilla, resting the foot on the chair. He then puts his hand on the shoulder to fix the scapula, and with the other depresses the elbow over his knee.

5. According to the method invented by Mr. White of Manchester, and revived by Malgaigne, the patient lies down, and the surgeon sits behind him. The scapula is well fixed, by placing one hand upon the shoulder, or by passing a jack-towel over the shoulder and fixing it to the opposite corner of the bed; then the arm is raised from the side, and drawn straight up by the head, till the bone is thus elevated into its socket.



Modifications of this process have long been in use on the Continent; and there is no doubt but that English bone-setters have some plan by which the leverage afforded by the length of the limb is made available for tilting the head into its socket. For this purpose the elbow is straightened, and the limb raised and moved in a circular direction, so as to dislodge the head of the dislocated bone, and enable the muscles to draw it into its socket.

The extension used in reducing the dislocation *forwards* must be made in a direction downwards and backwards. For the dislocation backwards, extension should be made forwards.

After reduction a pad should be placed in the axilla, and the arm and shoulder be supported for some days with a figure-of-8 bandage, a few turns of which should confine the arm to the trunk. Warm fomentations—perhaps leeches—and subsequently frictions, will relieve the pain and swelling. The more weak and flabby the patient, or the oftener the dislocation has occurred, the longer will confinement be necessary, in order to allow of a complete consolidation of the ruptured ligament. In fact, when the dislocation has occurred more than twice, an apparatus consisting of a clavicle bandage, with a broad band round the head of the humerus, should be worn for some months, so as to restrain the motions of the joint.

It has been before directed that this and all other dislocations should be reduced as soon as possible after the injury. If the reduction has been delayed till the muscles have fixed the part, and the patient is robust, it may be necessary to bleed or administer tartar-emetic or chloroform, and to make a long, slow, and gentle, but unremitting extension by the pulleys. When the extension has been continued some time, the surgeon may gently rotate the limb by the forearm, or lift the head of the bone. If the dislocation has lasted some time, there will be still greater necessity for a tedious operation. Sir A. Cooper's opinion is, that a reduction ought not to be attempted after three months. But the criterion which Mr. B. Cooper has proposed is a better one; and that is, the degree in which the arm has been exercised, and the amount of useful motion which it has acquired in its new situation; for, in proportion as the head of the bone has formed for itself a new socket, so most likely will the old socket have become unfit for its reception again. There are numerous instances on record, of the most disastrous and even fatal results that have ensued from attempts at reduction at a later period: the integuments and muscles have been lacerated; abscess has formed, and been followed by anchylosis of the joint; nay, even the whole side has been palsied from injury to the cervical vertebræ, and the axillary artery has been torn across.

Injuries of the shoulder-joint are liable to be followed by various obstinate and intractable affections, owing probably to the supervention of the state described at p. 265, as *chronic rheumatic arthritis*. The capsular tendons, and long head of the biceps waste away, and the articular surfaces are altered in shape, and partially displaced. Such cases were formerly described as *dislocation upwards, and rupture of the biceps*. Sometimes the deltoid muscle wastes away, owing, probably, to injury of the circumflex nerve. Violent spasms and neuralgic pains of the arm sometimes occur from injury to the other nerves.*

IV. DISLOCATION OF THE ELBOW presents six varieties. Both radius and ulna may be dislocated, 1, simply backwards; or, 2, backwards and outwards; or, 3, backwards and inwards. 4. The ulna by itself may be dislocated backwards; and the radius by itself either, 5, backwards; or 6, forwards.

1. When both radius and ulna are dislocated *backwards*, the elbow is bent at a right angle, and is immoveable. The olecranon projects much behind; a hollow can be felt at each side of it, corresponding to the great sigmoid cavity; and the trochlea of the humerus forms a hard protuberance in front. The coronoid process rests in that fossa of the humerus which naturally contains the olecranon.

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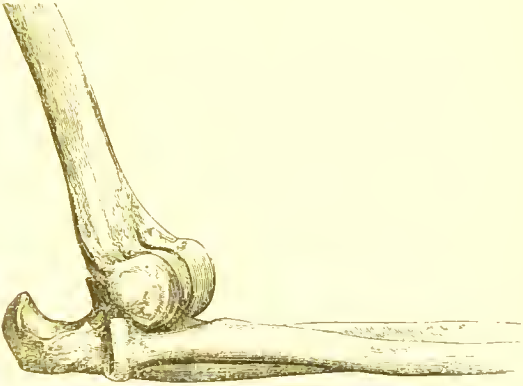
* See Stanley on Rupture of the Biceps Tendon, Lond. Med. Gaz., vol. iii., and Soden, Med. Chir. Trans., 1841.

2. In dislocation of *both bones backwards and outwards*, the coronoid process is thrown behind the external condyle; and in addition to the preceding symptoms, the head of the radius can be very plainly felt on the outer side of the joint.

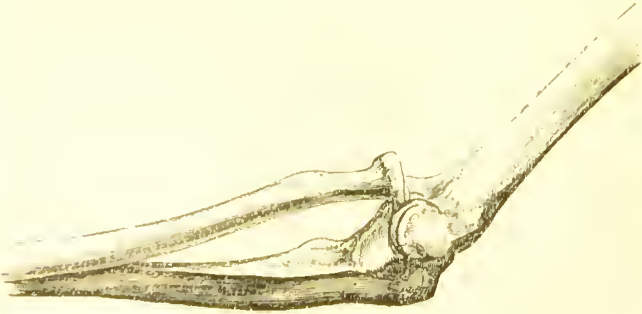
3. The dislocation *backwards and inwards* is known by a great projection of the outer condyle, in addition to the symptoms of the first variety.



4. In *dislocation backwards* of the *ulna solely*, the olecranon is much projected backwards, the elbow is immoveably bent at right angles, and the forearm is much twisted and pronated.

The *treatment* of these four varieties is the same. Reduction may be effected, *first*, by fixing the lower end of the humerus whilst the forearm is drawn forwards; or, *secondly*, the surgeon may bend the elbow forcibly over his knee; or, *thirdly* (if the case be quite recent), he may forcibly straighten the arm, so as to make the tendon of the biceps pull the *trochlea* of the humerus back into its place.

5. The head of the *radius alone* may be *dislocated forwards*; being



thrown against the external condyle. The elbow is slightly bent, and, in bending it more, the head of the radius can be felt to strike against the front of the humerus.

Treatment.—Simple extension from the hand, the elbow being straight.

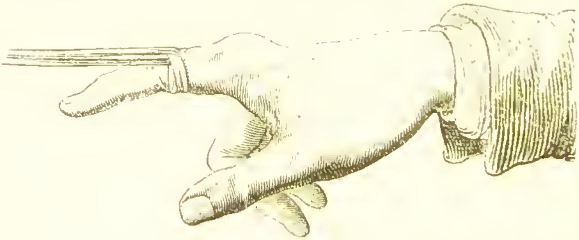
6. Dislocation of the *radius backwards* is very rare. The head of the bone can be felt behind the outer condyle. *Reduced* by simply bending the arm, which should be kept bent for three weeks.

Diagnosis.—These dislocations of the elbow may be distinguished from fractures of the lower extremity of the humerus, 1, by the impaired mobility of the joint, and by the absence of crepitus; 2, by measuring the length of the humerus from its condyle to the shoulder; which, in dislocation, will be equal to that of the sound limb, but will be diminished in fracture of the lower extremity of the humerus. But when it is considered that these six dislocations may be combined with various fractures of the condyles of the humerus and of the bones of the forearm, it will be admitted that the injuries of the elbow present a sufficiently wide and complicated field of study.

V. DISLOCATIONS OF THE WRIST may readily be distinguished by the altered position of the hand, which is thrown either backwards or forwards if both bones be dislocated, or twisted if only one be displaced,—and by the alteration of the natural relative position of the styloid processes of the radius and ulna with the bones of the carpus. They are reduced by simple extension.*

VI. DISLOCATIONS OF THE HAND.—The *os magnum* and *os cuneiforme* are sometimes partially dislocated through relaxation of their ligaments, and form projections at the back of the hand, which must not be mistaken for ganglia. Mr. Fergusson has also known the os pisiforme dislocated by the action of the flexor carpi ulnaris muscle.

Treatment.—Cold affusion, friction, and mechanical support.



Dislocations of the *thumb*, *fingers*, and *toes*, are difficult of reduction, in consequence of the strength and tightness of their lateral ligaments, and the small size of the part from which extension can be made. A firm hold may be obtained by means of a piece of tape fastened with the knot called the *clove hitch*, represented in the figure in the preceding page. But it is a good plan to place a part of the tape round the head of the dislocated bone, so as to pull it straight forwards into its place. Extension should be made towards the palm, so as to relax the flexor muscles. But, "before the reduction has been effected," says Mr. Liston, "it has been in some cases even found necessary to divide one of the ligaments; the external is most easily reached; it is cut across by introducing a narrow-bladed and lancet-pointed knife through the skin at some distance, and directing its edge against the resisting part."

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* Dupuytren taught that these dislocations are extremely rare, or, in fact, almost impossible; and that fractures of the lower extremity of the radius are generally mistaken for them. But the experience of English surgeons shows that real dislocation, without any fracture, is not by any means uncommon. See a very carefully reported case in the Lond. Med. Gaz., June 17th, 1843.

In compound dislocation of the first phalanx of the thumb on the metacarpal bone, the head of the phalanx should be sawn off before attempting reduction; and in compound dislocation of the second phalanx, it is better to saw off the head of the first.

VII. DISLOCATION OF THE RIBS.—The costal cartilages may be torn from the extremity of the ribs, or from the sternum;—and the posterior extremity of the ribs may be dislocated from the spine by falls on the back; but these accidents are very rare: A case is related in which the heads of the last two ribs were driven forwards from the spine, in a boy of eleven, by a violent blow on the back; abscess formed and the case terminated fatally.* The body of the sternum has also been dislocated in front of the manubrium, and the ensiform cartilage is

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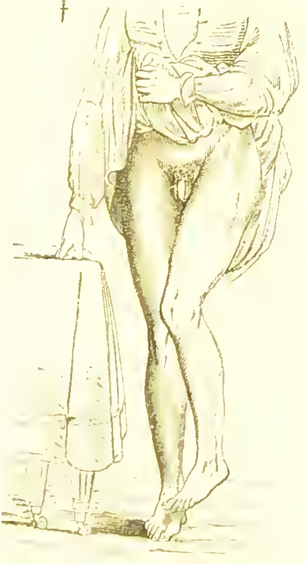

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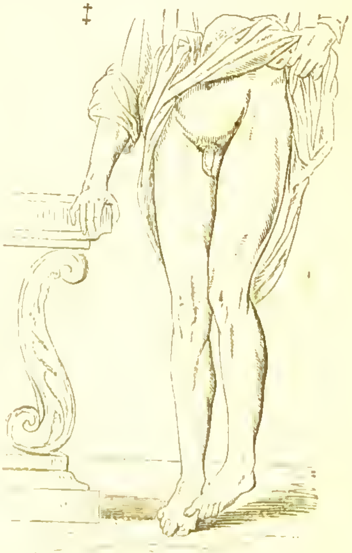

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* Dublin Med. Press, 3rd Feb. 1841.

† Dislocation upwards of the Hip-Joint. From Sir A. Cooper.

‡ Dislocation backwards of the Hip-Joint. From Sir A. Cooper.

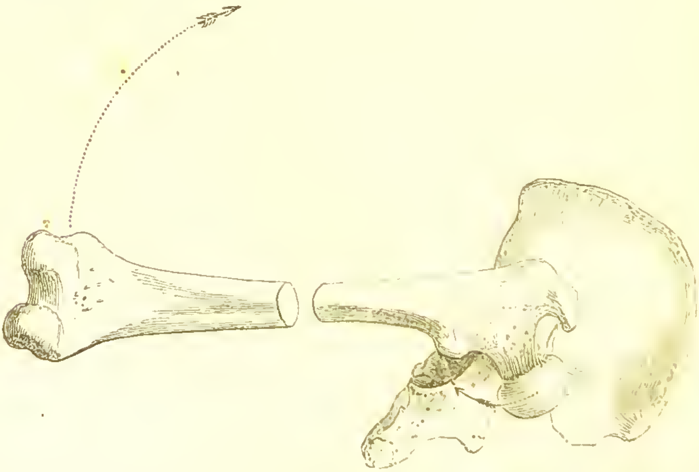
sometimes separated. In all these cases, the same local and constitutional treatment must be adopted as was prescribed for fracture.

VIII. DISLOCATIONS OF THE HIP-JOINT.—There are four principal varieties of this dislocation. 1st. The dislocation upwards: in which the head of the bone is thrown on the dorsum ilii. 2ndly. The dislocation backwards on the sciatic notch; 3rdly, downwards, on the obturator externus muscle; and 4thly, forwards, on the os pubis. Besides which there are two or three others that are exceedingly rare.

1. Dislocation *upwards on the dorsum ilii* is the most frequent.

Symptoms.—The limb is from an inch and a half to two inches and a half shorter than the other; the toes rest on the opposite instep; the knee is turned inwards, and is a little advanced upon the other; the limb can be slightly bent across the other, but cannot be moved outwards; the trochanter is less prominent than the other, and nearer the spine of the ilium; and if the patient is thin, and there is no swelling, the head of the bone can be felt in its new situation.

Diagnosis.—Fracture of the *cervix femoris* may be distinguished from this dislocation by the circumstance that the limb can be freely moved in any direction, although with some pain; that it is turned outwards instead of inwards; and that it can be drawn to its proper length by moderate extension, but becomes shortened again as soon as the extension is discontinued: whereas in dislocation, it requires a forcible extension to restore the limb to its proper length and shape; but when once the head of the bone is replaced in its socket, it remains there.*



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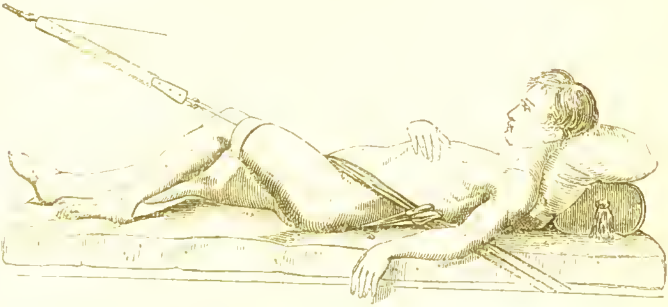
* There are a few cases on record of fracture of the upper extremity of the femur, in which a portion of the great trochanter was broken off, and drawn by the muscles backwards on the dorsum ilii, into the position usually occupied by the head of the bone when dislocated; so that the nature of the accident was obscure.

Treatment.—As we have said at pp. 280 and 285, dislocations may be reduced by manœuvring or by main force: the former being the preferable plan if it can be adopted.

The manœuvre by which a dislocated hip can be reduced (sometimes called the *flexion method*) consists in employing the length of the limb as a lever, by which the head may be got into such a position as to slip into its socket. For this purpose the knee must be bent on the thigh, and the thigh on the pelvis: the surgeon then grasping the ankle with one hand, and the knee with the other, causes the thigh to perform a circular movement of abduction, finishing with a slight rotatory movement, when the bone will probably be replaced. Chloroform should be used, if there is any difficulty. See the diagram, p. 290.*

When the patient is old and of relaxed fibre, dislocations of the hip may be reduced by a method analogous to the *heel in the axilla*. The surgeon sits and presses one foot against the perinæum, whilst extension and rotation are effected by his assistants.



But if main force must be resorted to, the patient must be thoroughly chloroformed, and placed on his back on a table; a leathern girth or strong towel should be passed round the upper part of the thigh, so as to bear firmly against the perinæum and crista ilii, as represented in the foregoing cut, which was sketched from nature by Mr. W. Bagg; and this should be attached to a ring or hook securely fastened into the wall or floor. A linen roller should next be applied to the lower part of the thigh, and over it the strap belonging to the pulleys; which last are to be fixed to the wall or some other firm object. Then extension is to be made in such a direction as to *draw the thigh across the opposite, a little above the knee.* After a little time, the surgeon should gently rotate the limb, or lift the upper part of it, and the head of the bone will probably return to the acetabulum. The patient should then be carefully moved to bed, with his thighs tied together.

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* The foregoing diagram may explain the mechanism of reduction. The process is well summed up by a writer in Medical Times, 30th June, 1855:—"Lift up, bend out, roll in." See case by Mr. Cock, ibid.

2. The dislocation *backwards* (commonly called the dislocation *into the sciatic notch*) is a modification of the preceding, and is known by the following symptoms. The limb is shortened from half an inch to an inch; the toes rest on the ball of the great toe of the other foot; the knee is advanced and turned inwards, but not so much as in the last case; the trochanter is rather behind its natural position, and the head of the bone can scarcely be felt.

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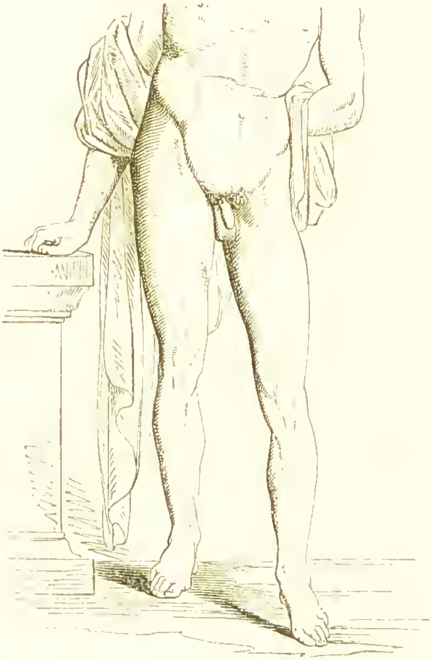

Treatment.— Reduction by flexion if possible. If main force is used, the patient should be placed on the sound side, and the limb be drawn across the middle of the opposite thigh. After a little while, the upper part of the limb should be lifted by means of a napkin, so as to raise the head of the bone over the edge of the acetabulum, the thigh being at the same time rotated outwards.†

3. In the dislocation *downwards*, the head of the bone is thrown into the *thyroid foramen*, or on the *obturator externus*. The *symptoms* are as follow:—the limb is lengthened one or two inches; it is drawn away from the other; the toes

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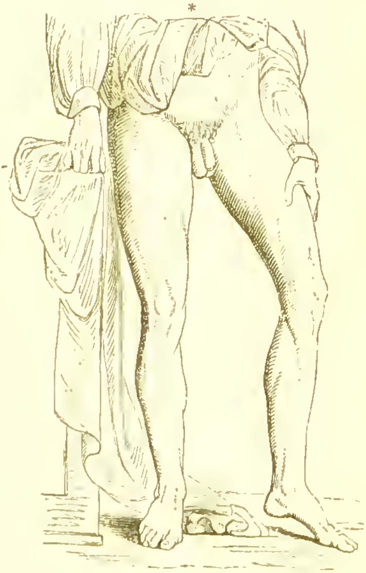
* Dislocation downwards. From Sir A Cooper.

† The above account is condensed from Sir A. Cooper, op. cit. chap. ii. sect. iv. Mr. Richard Quain has published (Med. Chir. Trans. vol. xxxi.) an account of a careful dissection of a recent case of this injury, and of experiments made to determine the exact relation of the visible deformity to the true position of the head of the bone; and has concluded that, in the ordinary form of this dislocation, the head of the femur does not reach the sciatic notch, but is lodged immediately behind the acetabulum, over the base of the ischiatic spine, and opposite to a small part of each of the two sacro-sciatic foramina; that the advanced position of the displaced limb at the knee, and the situation of the foot with "the toe resting against the great toe of the other foot" are not necessarily present; that during the extension the thigh should be at a right angle with the abdomen, and in a state of abduction; that the extending force should be applied above the knee; and that this joint should be bent in order to relax the sciatic never, which runs either immediately before or behind the displaced head of the bone.

point downwards and directly forwards; and the body is bent forwards, because the psoas muscle is on the stretch.

Treatment.—The object is to draw the head of the bone outwards, and rather upwards. There are two methods of effecting this. In the first place, the patient may be laid on his back on a bed, with one of the bedposts between his thighs, and close up to the perinæum. Then the foot may be carried inwards, across the median line; so that the bed-post, acting as a fulcrum, may throw the head of the femur outwards. But the foot must not be *raised*, otherwise the head of the femur may slip round under the acetabulum into the sciatic notch. (2.) Or the pelvis may be fixed by straps, and the pulleys be applied to the upper part of the thigh, to draw it outwards: whilst the knee is at the same time pulled downwards and inwards.

4. In the dislocation *upwards and forwards* (on the pubes), the limb is shortened about an inch; very moveable; it is drawn away from the other, and the foot points directly outwards; the head of the bone may be plainly felt below Poupart's ligament; and by this circumstance this dislocation may be distinguished from fracture of the cervix femoris.



Treatment. — Flexion may be tried; putting a bedpost between the patient's thighs, and abducting the limb, so as to throw the head of the bone downwards. If the pulleys are used, the patient is to be laid on the sound side; extension should be made in a direction backwards and outwards; and after it has been continued a little time, the head of the bone should be lifted over the edge of the acetabulum by means of a napkin.

Sir Astley Cooper has decided that eight weeks is the latest period after which it is justifiable to attempt the reduction of a dislocated hip, except in persons of extremely relaxed fibre or of advanced age; and numerous instances are on record of death from abscesses or phlebitis, occasioned by violent extension at a later period.

With respect to the relative frequency of these dislocations, Sir A.

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[*] Dislocation forwards. From Sir A. Cooper.

Cooper believed that out of twenty cases, twelve would be on the dorsum ilii, five in the ischiatic notch, two in the foramen ovale, and one on the pubes.*

UNUSUAL DISLOCATIONS.—Besides the above four varieties, a dislocation directly downwards on the tuberosity of the ischium; one directly backwards on the spine of the ischium; and one directly upwards on the space between the anterior spinous processes of the ilium, have been known to occur, although very rarely. In a case of dislocation directly downwards, recorded by Mr. Keate, the limb was lengthened three inches and a half, and was fixed and everted; the trochanter was sunk; and the head of the bone, close to and on a level with the tuberosity of the ischium, where it was capable of being moved under the finger. In a case of dislocation on the spine of the ischium, which happened in the practice of Mr. Earle, at St. Bartholomew's, the limb was lengthened about half an inch; it was neither everted nor inverted, but if anything the latter; there seemed to be a great vacuity in front of the hip; the edges of the sartorius and tensor vaginæ femoris could be plainly felt, and a cavity behind them; and the trochanter was further back, and not so prominent as usual. But the dislocation directly upwards is the most common of these unusual forms. In a case that was examined by Mr. Travers, jun., some time after the accident. the limb was completely everted and slightly moveable; and the neck of the bone lay between the two anterior spinous processes of the ilium; so that when the patient was erect, the limb seemed to be slung or suspended from this point. The diagnosis must in such cases be guided by an attentive examination of the deformity that is present, and by the absence of any symptoms of fracture. The reduction must be effected by extension, made in such a direction as seems most likely to bring the head of the bone into its socket.†

IX. DISLOCATIONS OF THE KNEE.—Dislocation of the *tibia from the femur* is not very common; and, when it does occur, is rarely complete. In most cases the tibia is thrown backwards towards the ham. The deformity and impediment to motion will enable the practitioner to distinguish the accident; and if there be no complication requiring amputation, the displacement must be rectified by simple extension, and the knee be kept at rest till inflammatory symptoms have subsided. There often remains a permanent inability to keep the joint firm in the straight position.

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* These dislocations generally happen to adults. In very old people it is more common for the cervix femoris to give way. They are also rarely met with in children, although Sir A. Cooper relates one case which happened to a boy of seven; Mr. Travers, jun., one to a boy of five; and the late Mr. Place, of Wimborne, was good enough to communicate to the author the particulars of a case of dislocation on the dorsum ilii happening to a boy of ten.

† See a paper on Rare Dislocations of the Hip Joint, in the Med. Chir. Trans., vol. xx., by Mr. Travers, jun. Guy's Hosp. Rep., vol. i., Keate, Med. Gaz., vol. x.; a case of dislocation directly upwards, Lancet, May 15th, 1841; Mr. Earle's case, Lancet, vol. xi., p. 159; case of dislocation downwards and backwards (with dissection and drawing), by Mr. Wormald, Med. Gaz., 28th Jan 1837.

Dislocation of the Patella may occur either inwards or outwards; more frequently in the latter direction. The symptoms are, that the knee cannot be bent, and that the bone can be felt in its new situation. This dislocation may be caused either by mechanical violence, or by a sudden contraction of the extensors of the thigh. It mostly happens to knock-kneed, flabby people. There is, in general, no difficulty in reducing it by means of the finger and thumb, if the knee is straight and the leg raised. There is one variety of this dislocation, however, in which the patella is turned round on its long axis, so that its outer edge lies immediately under the skin, and its inner edge rests on the trochlea of the femur, where it is as firmly fixed as if screwed down. In one instance, the surgeon was unable to reduce it by any means, even although he divided the ligamentum patellæ, and cut through the quadriceps at its insertion into the patella; and the patient died in eleven months, in consequence of his wounding the joint. Mr. Mayo relates a similar case, in which he succeeded in overcoming the difficulty by bending the knee to the utmost, so that the patella was drawn out of the groove in which it was lodged.*

The patella is dislocated upwards after rupture of its tendon by the extensor muscles. This must be treated as fracture of the patella; but it is very rare.

Partial Dislocation of the Semilunar Cartilages.—During sudden twists of the knee-joint, the semilunar cartilages may slip out of their proper position, and become wedged in between the tibia and femur. The symptoms are, sudden extreme sickening pain, and inability to stand, or to straighten the limb. This accident generally happens to people of relaxed habits, and when it has once happened is very liable to recur. In a case dissected by Mr. Fergusson, the external semilunar cartilage was found to be torn from its connexion with the tibia, except just at its extremities. The best way of restoring the part to its place, is to place the patient on the affected side, with the knee bent, and rotate the tibia gently in its axis. Should this not succeed, says Mr. Vincent, "the only thing is to keep the patient in bed, and in some of his slumbers all will come right" of itself. The patient should put on an elastic knee-cap before he moves about.

Dislocation of the Head of the Fibula is of very unfrequent occurrence; except as a consequence of relaxation of the ligaments from weakness, which must be treated by blisters, and bandages, with a pad to press on the head of the bone. There are two cases of it, caused by violence, in Sir Astley Cooper's work; the head of the bone could be felt to pass more backwards than natural, and could be moved by the finger. The pad of a tourniquet was employed to keep it in its place.

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* Three cases are related in Sir A. Cooper; and a similar one in Sir G. Ballingall's Military Surgery. Mr. Vincent says, that the obstinate resistance which this dislocation offers is owing to the fact that when the limb is straight, the extensor muscles, which are the retaining force, are in their position of strongest action; when the knee is bent they are in their weakest position. Op. cit. p. 74.

X. Dislocation of the Ankle is generally caused by jumps from great heights or from carriages in motion, and may occur in four directions, each of which is usually complicated with fracture of tibia or fibula, or both. 1. Dislocation of the *tibia inwards* is the most common. It is attended with fracture of the lower third of the fibula, and may be easily known by the sole of the foot turning outwards; its inner edge turning downwards; and great projection of the internal malleolus. 2. Dislocation of the *tibia* and *fibula outwards* is attended with fracture of the internal malleolus, and may be known by the sole of the foot turning inwards. 3. In the dislocation *forwards*, the foot appears shortened, and the heel lengthened, and the toes pointed downwards. There is also a partial dislocation forwards, in which the tibia is only half displaced from its articulation with the astragalus, the fibula being also broken; the foot appears shortened and immoveable, and the heel cannot be brought to the ground. 4. A dislocation backwards

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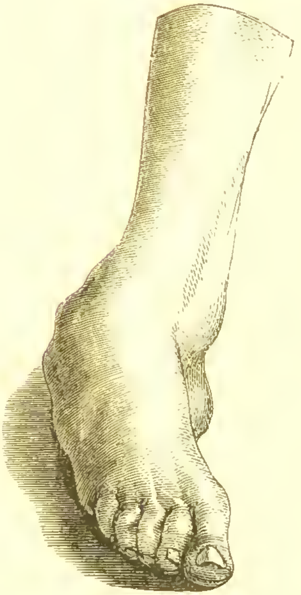

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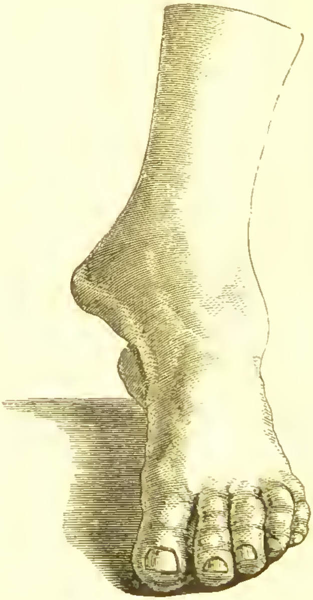

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[*] Unreduced dislocation of the tibia inwards, with fracture of fibula; from a cast taken by Mr. Willmott, of St. Mary's Hospital, a year and a half after the accident. There was no attempt at reduction.

[†] Astragalus thrust up between tibia and fibula. Accident of five years' standing; no attempt had been made at reduction. There was no fracture. From a cast by Mr. Willmott.

has been described; but it must be excessively rare, as Sir A. Cooper never saw it. There is a case of it described by Mr. Colles, which, however, was probably one of transverse fracture of the tibia and fibula just above the joint, with displacement backwards. The fracture of the fibula about three inches above the outer malleolus, which accompanies the dislocation inwards, is commonly called Pott's fracture. As a fifth variety, may be quoted the thrusting up of the astragalus between the bones of the leg, as represented in the adjoining cut.

Treatment.—These injuries may be so various and complicated, that it is impossible to lay down particular rules for every variety, although the general principles are clear. Reduction must be effected as soon as possible, and for this purpose the patient may either be laid on the injured side, with the knee and hip bent, or on the back, with the thigh raised, and knee bent. Then, whilst an assistant steadies the knee, the surgeon must grasp the instep with one hand, and the heel with the other, and make extension (aided by pressure on the head of the tibia), till he has restored the natural shape of the parts. Then the limb must be *put up* with a splint on each side, in the same manner as a fracture of the lower part of the leg, taking care to keep the great toe in its proper line with the patella; and it may be *slung*, or may be put on its side, according to the judgment of the surgeon; and the starch bandage applied according to circumstances. Chloroform may be administered to render reduction more easy, and opium in regular doses afterwards, to prevent displacement by twitching and spasm.

COMPOUND DISLOCATION of the ankle-joint is by far the most frequent example of that kind of injury. If the wound in the integument does not heal by the first intention, the joint inflames; suppuration occurs in about five days; much of the cartilage is destroyed by ulceration; at last the wound is filled with granulations, and the patient recovers a tolerably good use of the foot in from two to twelve months. The first thing to be done is, to wash away all dirt with warm water; to remove any shattered pieces of bone gently with the fingers, and then to reduce the bone to its place; slightly enlarging the wound in the skin, if necessary, in order to effect this without violence. If it is very difficult to return the end of the tibia, or if it is fractured obliquely, or much shattered, it is better to saw it off; as the patient will have quite as good use of the limb afterwards. Then the external wound should be closed with a bit of lint dipped in the patient's blood, and the leg be secured with a tailed bandage and splints, and be wetted with an evaporating lotion. Care must be taken not to let the foot be pointed, nor be turned to either side. The remaining treatment is the same as that of compound fracture; and the rules which are given as to the necessity of amputation are the same in both cases.

XI. DISLOCATIONS OF THE FOOT.—The most important of these are the dislocations of the astragalus, which may be separated from its connexion with the os naviculare and os calcis in various ways. Sometimes it is thrown inwards, so as to rest on the inner surface of the os calcis; and in this case, there appears an unusual projection below the inner ankle, and a corresponding depression below the outer one, and the whole foot seems displaced outwards. Sometimes it is thrown outwards; and then the foot seems to be displaced inwards. If these dislocations are simple, reduction should be immediately attempted by extension, and chloroform will be needed; perhaps the pulleys, for the reduction is often a work of difficulty; but patience and good management will usually succeed. Chloroform and opium ought to render unnecessary the proposal of dividing the tendons of refractory muscles. If the dislocation is compound, and the bone cannot be replaced, or if it is much shattered, it may be dissected out. In these two dislocations, the astragalus is separated from the other tarsal bones, but preserves its connexions with the tibia and fibula, so that they may be regarded merely as varieties of dislocation of the ankle-joint, in which the tibia and fibula carry the astragalus with them in their displacement. It may, however, be completely shot out from under the tibia, and lie under the skin of the outer side of the foot. And lastly, it may in the same way be dislocated backwards; projecting behind the ankle-joint, and pushing the tendo Achillis backwards. This displacement, if only partial, it will be extremely difficult to rectify, and if complete, it will most likely be impossible.*

Besides these, the five anterior tarsal bones may be dislocated from the os calcis and astragalus. The cuneiform bones may be dislocated upwards from the navicular; the metatarsal bones from the tarsal, and the toes from the metatarsal. In any of these cases, the proper position of the parts must be restored as much as possible by pressure and extension, and be preserved by bandages; but reduction will often be very difficult, if not impossible.

CHAPTER VII.

INJURIES AND DISEASES OF ARTERIES.

SECTION I.—WOUNDS OF ARTERIES.

Symptoms.—An artery may be known to be wounded by the profuse spirting out of florid blood, *per saltum;* that is to say in jets, corresponding to the beats of the pulse.

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* For cases of the dislocation of the astragalus backwards, see a paper by Mr. B. Phillips, Med. Gaz., vol. xiv., p. 596, and Fergusson's Practical Surgery. See also Mr. Cross's case of dislocation of astragalus reduced by dividing the tendo Achillis, quoted in Ranking, vol. ix., p. 140; Campbell de Morgan, B. Phillips, Lonsdale, and others, Lancet, 1849, vol. ii., p. 618. Henry Lee's case, in which the os calcis and the other bones of the foot were dislocated from the astragalus with the tibia, Lancet, 1852, vol. i., p. 313. Richard G. H. Butcher, of Dublin, on Fractures near the Ankle Joint; Dublin, 1852 (*objects to tenotomy as a means of facilitating reduction*).

Pathology.—The bleeding from wounded arteries must necessarily be often profuse and dangerous, because, from the nature of their coats, they do not collapse as the veins do; and because of the perpetual current of blood impelled by the heart.

But we find a provision in nature for avoiding this danger.

1. If an artery of small size, as the digital or the temporal, be cleanly cut across, there will be a pretty brisk hæmorrhage for a time; but it will soon cease, under the influence of the following natural processes.

First, the divided vessel *contracts*, so as to close its orifice; and so, also, as to lessen its canal immediately above, into the shape of the neck of a champagne bottle. If all goes on well, there is, secondly, the *exudation of fibrin* around the orifice; and thirdly, there is *coagulation* of the blood for a short distance within. The vessel also, fourthly, *retracts* into its sheath, if the surrounding tissues are loose enough to admit of it.

Under the influence of these four processes, the bleeding is checked; then if all goes on well, the contracted orifice is sealed up by the exuded lymph, and the coagulum within gradually becomes firmer, adheres to the walls of the vessel, loses its colour, fibrillates, and, in process of time, becomes organized into fibro-cellular tissue, forming, with the impervious end of the artery, a mere fibrous cord.

2. If a *very large* artery, such as the femoral or subclavian, is wounded, and if the aperture in it is large, and the flow of blood is in no manner opposed, the loss of blood will be so rapid as to occasion death almost instantaneously. If, however, the wound in the artery is very small, it may be closed firmly by coagulated blood during syncope, and the patient may survive if properly treated.

3. If the artery is of the second order, as the humeral or tibial, the bleeding will most probably cease for a time. But in the course of some hours, when the faintness has passed off, and the heart beats strongly again, the coagula in the orifice of the vessel will most probably be dislodged, and the bleeding will recur again and again, so that the patient will very likely die of it, unless it be checked by art. In some cases, however, the orifice of the vessel may become permanently closed.

4. A *puncture or partial division* of an artery may be much more troublesome than complete division; because the chief process for arresting hæmorrhage, namely, the *contraction*, is prevented; and the bleeding can only be obstructed by the coagulated blood in the wound. Under these circumstances, three things may happen. In the first place, the aperture, if longitudinal or very small, may in favourable cases be closed by adhesion, the artery remaining pervious. The uniting lymph, however, is very liable to be dilated into a *false aneurism*. Or, secondly, the channel of the artery may be obliterated by coagulated blood. Or, thirdly, bleeding may recur perpetually, till the undivided part of the vessel ulcerates, or is divided by art. From these details may easily be gathered the reason why, when a small artery has been

partially divided (as the temporal in arteriotomy), it is judicious to divide it completely.

When an artery is *torn across*, it contracts almost immediately, and becomes quite impervious, so that an arm or leg may be torn off by a shot or by machinery, without any loss of blood from the axillary or tibial arteries. For this reason, there is no hæmorrhage from the umbilical cord of young animals, which is either torn, or bitten through by the mother. Lastly, it will be readily seen that division of arteries which are diseased, or which are situated in condensed and inflamed tissues, so that they cannot contract or retract, will be followed by profuse bleeding. Hence it is, that after secondary amputation, in which the parts divided are condensed from inflammation, bleeding is much more copious, and many more ligatures are required, than after primary amputation.

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Treatment.—The first indication is to stop the flow of blood. For this purpose, if the wound is a small one, and there is bone underneath, as in the hand, forearm, or temple, the surgeon may make firm pressure on it with his thumb or finger: if the wound is wide and deep, he should poke his forefinger into it, wipe away all clots, and press with the point of the finger on the exact spot the blood issues from; or he may seize the bleeding orifice with his finger and thumb: in other cases, the blood may be checked by grasping the limb above, and pressing the main artery against the bone, with the points of the thumbs or fingers; or by applying the *tourniquet*;† or in default of that, by passing a handkerchief round the limb, and twisting it tightly with a stick. Immediate danger being averted by these means, the surgeon will probably apply a ligature.

Ligature.—When a stout thread is tied tightly around an artery, it divides the middle and internal coats, leaving the external or cellular coat enclosed in the knot.

If the student makes the experiment, and unties the knot, and slits up the artery, he will see the results shown in the next cut.

Then in the living body, the following series of phenomena occurs. The cut edges of the internal coats unite by adhesion, and the blood between the point tied and the nearest collateral branch coagulates and adheres to the lining membrane; and so the canal is sealed up. Meanwhile, the ring of the cellular coat enclosed in the ligature ulcerates;

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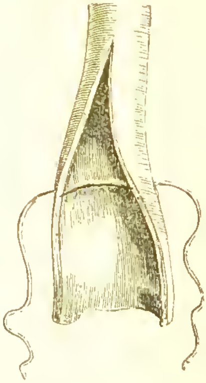
* Contracted artery from umbilical cord of a calf.

† The tourniquet is described in the Chapter on Amputations.

the ligature comes away in from five to twenty-one days (sooner or later, according to the size of the vessel), and, finally, that portion of the artery, which is filled with coagulum, shrinks into a fibrous cord.



The success of the operation will be promoted by using a small round ligature (of brown hempen thread), so as to divide the internal coats of the vessel smoothly, and by taking care to disturb it as little as possible from the surrounding parts which supply it with blood. If the place of ligature can be selected, it is better not to have it too near below the point where a large branch is given off; in order that the vessel may be sealed by a good coagulum before the ligature is separated; but this is of no great consequence.*

When, however, the artery is *diseased* and *brittle*, the ligature should be large, and not tied too tightly; otherwise it may cut through entirely; or else a small portion of the adjoining tissue must be included in the knot.

The manner of tying an artery is simple enough. If the orifice projects a little, as it does from the surface of muscles divided in amputation, it should be taken hold of with a forceps, and be gently drawn out, and then an assistant should tie a ligature round it as tightly and smoothly as possible in a double knot. If the bleeding orifice cannot be drawn out with the forceps, it may be transfixed with the *tenaculum;* but in some cases, where it is deeply seated or cannot be found, or is contained in a dense, consolidated tissue, it may be necessary to pass a curved *needle and ligature* through a considerable thickness of the flesh, and tie it up altogether. This was the practice usually adopted by surgeons of the last century, and is well called by John Bell, *groping* or *diving* with the needle. In all cases, however, where it is possible, the artery alone should be included in the ligature. After tying, one end of the ligature should be cut off, and the other be made to hang out of the wound. •Assalini's spring forceps, and the little wire forceps, or *serre-fines*, are useful when there is a lack of assistants.

When an artery is completely divided, it is necessary to tie both orifices; and if it is wounded, but not divided, a ligature must be placed by an aneurysm-needle both immediately below and above the wounded part. It is necessary to observe, that in all cases, when it is possible, *a wounded artery must be tied at the wounded part;* and not in the trunk above.

But here the question may be asked, Supposing that there is a wound of an artery situated at a great depth under muscles; or that the wound is in an inflamed or sloughy state; so that the adjacent parts are so infiltrated with blood that it must be extremely difficult to find the wounded vessel—would it not answer the purpose to tie the main trunk of the limb at some place between the wound and the heart, where it can be done easily—just, in fact, as an aneurysm is treated?

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* J. F. D. Jones, M.D., Treatise on Hæmorrhage and the Ligature, Lond. 1805; Porter on Aneurism.

The answer is, Certainly not:—the artery should be secured by two ligatures, one immediately above, and one immediately below the wound; and should not be tied in the trunk above: and the reasons for this rule must be evident enough from the following considerations. 1. A trunk may be tied that has no connexion with the branch wounded. Thus, in wounds of the upper part of the neck, the trunk of the common carotid has been tied many times when the bleeding vessel has been the *vertebral*. 2. There is the possibility of high division, or some other unusual distribution of the arteries. 3. The limb below must be supplied with blood, by collateral circulation, else it will mortify. "But whenever," to use Mr. Guthrie's words, "this collateral circulation is sufficient to maintain the life of the limb, blood must pass into the artery below the wound, and must, as a general rule, pass up and out through the lower end of the divided artery." 4. Gangrene is very liable to follow if a ligature be placed high up in the thigh, in consequence of a wound. 5. The lower end of a wounded artery is not so quickly and effectually closed by a natural process of cure, as the upper, and is exceedingly liable to yield to the blood that regurgitates into it from below, and to bleed again and again until closed by ligature.

Wherever, therefore, an artery may be wounded, it should be secured at the wounded part, *if practicable*. We say *if practicable*, because in any case, if a man cannot do the best thing, he must do the best he can.* (See page 138.)

When the wound in the skin is not sufficiently gaping to expose the bleeding part, the finger or a bougie should be first passed down as a guide to it, and then it should be laid open by a sufficiently long incision upwards and downwards. But if it is clear that a vessel is wounded by a stab from the remote side of the limb (as if the femoral is pierced by a wound at the back of the thigh), a bougie may be passed in, as before, as a guide for the incisions, but the operator may lay the vessel bare at the side where it is most easily accessible.*

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* The rule of practice is well shown by a case which occurred to Mr. Butcher, of Dublin. A man was deeply stabbed in the right thigh by a knife; profuse and almost fatal hæmorrhage ensued, which ceased, but after thirteen hours returned; the wound 1½ inch long, in the long axis of the limb, a little above its middle, right over the sheath of the femoral artery, which was laid bare by it. The artery above being compressed, Mr. Butcher passed his left forefinger into the wound, but could not reach the bottom of it. Then he dilated it upwards and downwards for at least three inches. This allowed him to pass his forefinger still more deeply along the course of the wound, *far behind the femoral artery*, which lay between the finger and the bone. The tourniquet being slackened, up came a gush of scarlet blood from the *very deepest* part of the wound. The forefinger being now passed still more deeply in the track of the wound, entered a kind of tendinous slit. This was enlarged, yet the finger could not reach the bleeding point, though the wound was deep enough to bury the fingers and part of the hand. The patient being almost dead, and the least movement or the shifting of the tourniquet impracticable, Mr. Butcher at once secured the common femoral, below Poupart's ligament, by a transverse incision. This checked further bleeding, but the patient died of exhaustion twenty-four hours from the accident. A *p. m.* showed that the knife had sliced off a portion of the tube of the profunda artery, immediately behind the upper margin of the adductor longus tendon.—On Wounds of Arteries, by Richard G. H. Butcher, Dublin Quarterly Journ. Med. Sc., Aug. 1854.

Besides the ligature, the following measures are useful in various cases—

1. *Torsion* is performed by drawing out the vessel, fixing it by a pair of forceps a quarter of an inch from the end, and then twisting the end round and round till it will not untwist itself. There is no English authority for applying this method to large arteries, but it may be useful enough when many minor vessels bleed after the extirpation of a tumour.

2. *Pressure* is a means of suppressing hæmorrhage that may be resorted to either when the ligature is deemed unnecessary, or when it cannot be applied. Thus it is applicable to wounded arteries of small size situated immediately over bones—as the temporal; or to arteries that cannot be tied, because they lie very deeply—as the external carotid in the parotid gland; or to arteries that are so diseased that a ligature will not hold. The pressure must be confined as much as possible to the bleeding orifice, and should be effected by a *graduated compress: i. e.*, one composed of several pieces gradually decreasing in size, the smallest being on the wound. It is also a good plan to apply pressure to the course of the trunk above the wound. Moreover, when pressure is to be relied upon, the whole limb, including the fingers or toes, should be accurately bandaged from its extremity, in order to diminish its entire circulation, and it should be placed in a raised position. When the palmar arch is wounded, one compress may be placed on the wound, and another on the back of the hand; a paper-knife or strong slip of wood may then be laid on each compress transversely across the hand, and their ends be firmly tied together. Signorini's tourniquet may be of use.

3. *Cold* (especially sponging with iced water, or covering the bleeding part with ice in bladders) is applicable to cases of bleeding from numerous small vessels.

4. *Styptics* are of various kinds. 1. Some of them check hæmorrhage by opposing a mechanical obstacle to the exit of blood—as the *agaric*, and other porous substances which entangle it; 2, others act by coagulating the blood; or 3, by causing contraction of the bleeding vessels; or 4, by exciting the adhesive inflammation and formation of granulations. The tincture or solution of perchloride of iron; a saturated solution of alum; turpentine, creosote, the nitrate of silver, and the *matico* leaf, are the best. They are applicable to the same cases as cold and pressure; that is, when the bleeding vessels are very nume-

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* Guthrie on Diseases and Injuries of Arteries, p. 254, Lond. 1830; Lectures in Lancet, 1849, vol. i.

rous and small. The *actual cautery*, which is the most potent styptic of all, has two operations. If the iron be *red hot*, it stops bleeding mechanically, by burning up the orifices of the vessels; but the bleeding is liable to return when the eschar separates. It is better, therefore, to use the iron at a *black heat*, for it then excites the adhesive inflammation; and is very efficacious for arteries that either cannot be tied, or that are too diseased to hold the ligature. A *pinch with the forceps* will often cause small vessels to cease bleeding. Many obstinate hæmorrhages from small vessels cease when the wound is cleared of coagulum, and the bleeding part exposed to the air, or sluiced with iced water, and bound up again.

5. *Medical Treatment.*—In cases of arterial hæmorrhage, which there is any difficulty in restraining by ligature or otherwise, it will be necessary to keep the patient in the recumbent posture, and to tranquillize the heart's action by opium. The diet should consist of milk, broth, and other substances that nourish without stimulating.

Supposing that so great a loss of blood has taken place as to endanger the patient's life, the head must be kept low: beef-tea with brandy be given frequently by spoonfuls, and opium in small doses every three or four hours. In a desperate case, where life would evidently be lost without it, *transfusion* should be resorted to. See Part v. Chap. ii.

SECTION II.—SECONDARY HÆMORRHAGE.

SECONDARY HÆMORRHAGE may be defined to be that which comes on after the lapse of a few hours, or later, after an injury. There are several varieties.

1. It often happens that in a few hours after a wound has been bound up, and the patient put to bed and become warm, sundry small arteries bleed. This case is easily managed. The wound must be opened; any vessels must be tied that require it; the surface be sponged with cold water, and then be exposed to the air for a few hours.

2. A second variety is that which has been so ably described by Mr. Guthrie,* and which occurs when a wound of the femoral artery is treated like an aneurysm, by tying the vessel at a distance, instead of tying it immediately above and immediately below the wound. Mr. Guthrie lays down the following propositions, viz., That although any artery in the *upper* extremity may be tied anywhere with very little risk of gangrene, yet that gangrene of the foot and leg often follow when a ligature has been placed high upon the femoral artery, in consequence of a wound. This is not the case when the ligature is applied for an aneurysm, because then the collateral circulation has had time to enlarge before the operation. But if after ligature of the femoral, the collateral circulation is sufficient to maintain the life of the limb, the blood will pass into the large arteries below the part tied. Then if

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* Commentaries on Military Surgery, 6th ed., p. 190 et seq.

there be nothing to hinder it, the blood will escape from the lower orifice of the wounded artery.

Mr. Guthrie shows also that the processes by which the ends of a divided artery are healed, are less perfect in the lower end than in the upper. The artery does not contract so much, neither does it retract, neither is there a perfect internal coagulum, neither is there an exudation of such plastic lymph. Hence when blood begins to pass into the lower part of the vessel through the collateral circulation, the wounded part gives way to the pressure.

The characteristics of this kind of hæmorrhage are, that the blood (to quote from Mr. Guthrie) "is of a venous colour, and flows or wells out in a continuous stream, as water rises from a spring, and not with an arterial impulse." It may come on at almost any interval till the wound is healed.

The prevention of this accident will consist in observing Mr. Guthrie's rule, to tie every wounded artery at the wounded part if practicable. If hæmorrhage does occur, the vessel should be cut down upon and secured. Nevertheless, in no case, says Mr. Guthrie, should an operation be done on a wounded artery unless it bleeds. For if it does not bleed, rest and pressure may avert the necessity of any operation at all. See page 139.

3. There may be a *general oozing* of blood from a wound, owing to some disorder of the general health. Its *causes* and *treatment* are described in the Chapters on Hæmorrhage, and on Gunshot Wounds, p. 138. The surgeon must recollect its liability to occur in the female from the menstrual nisus.

4. Hæmorrhage may occur from *sloughing* or from *ulceration* of an artery; or from imperfect closure of an artery when a ligature separates; through the influence of some diseased state of the artery or of the constitution, which has prevented the healthy process of adhesion. This form of hæmorrhage will be more likely to occur if the ligature was coarse, thick, and ill applied, so as to bruise the internal coats instead of cutting them evenly; or if the artery was much disturbed in its sheath during the operation. In such a case the only remedy is to cut down upon and tie the bleeding orifice; or, if that cannot be done, or the vessel be too diseased to hold the ligature, carefully-graduated pressure and styptics may be tried. A small button of lint, imbued with turpentine or with solution of perchloride of iron, may be put on the bleeding point (or the latter may be touched with a black-hot iron first), over that a larger compress, and so on, till firm pressure can be produced. Should all these measures fail, the trunk must be tied above at the nearest point to the wound that is possible.

In the case of hæmorrhage from an artery laid open by hospital gangrene or phagedæna, the actual cautery and pressure are the best remedies.

SECTION III.—DIFFUSED AND TRAUMATIC ANEURYSM, AND ANEURYSMAL VARIX.

I. Diffused Aneurysm.—When an artery has been lacerated, by a broken bone, for instance, without a wound of the skin, or when an artery has been stabbed, and the wound in the skin has healed, but that in the vessel remains open, so that the blood escapes into the cellular tissue, a *diffused aneurysm* is said to be formed. But this term is not at all descriptive of the real state of things, and is very liable to lead the young practitioner into the error of treating the case as if it were a real aneurysm. The fact is, that a real aneurysm has a *sac*; the diffused aneurysm has none. Hence the escape of blood from the wounded part may be unlimited.

The *symptoms* are, a dark-coloured swelling of the limb; perhaps fluctuating; perhaps yielding some degree of pulsatory thrill, if the aperture in the artery is large; and most probably, if a main trunk is wounded, there will be coldness, numbness, absence of pulsation, and tendency to gangrene in the parts below. This case must not be treated as if it were an aneurysm, by a ligature high up; but the main artery being compressed with the fingers, the swelling must be laid open, the blood removed, and the wounded part of the artery secured by two ligatures, one immediately above, the other just below it. The whole field of surgery does not present a more difficult operation, nor one requiring greater judgment, nerve, and dexterity.* This is a case, in which, as John Bell well said, boldness is better than caution. "Run your bistoury upwards and downwards, so as to slit up the tumour quickly; plunge your hand suddenly down towards the bottom; turn out the great clots of blood with your fingers, till having reached the bottom entirely, *you begin to feel the warm jet of blood*: and directed by that, clap your finger upon the wounded point of the artery; as it has but a point your finger will cover it fairly, and your feeling the beating of the artery assures you that all is now safe."* After the operation, considerable suppuration, perhaps sloughing of the sac and parts infiltrated ensues. This must be treated on general principles.

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* In addition to the numerous capital cases illustrative of these doctrines, which are to be found in Mr. Guthrie's Commentaries, a very ably and fairly reported case, which occurred in the practice of Mr. Henry Smith (Med. Times, June 23rd, 1855), well deserves perusal. An old man met with a punctured wound at the upper part of right thigh; arterial bleeding followed, but soon ceased. A tumour formed, occupying the whole of the front of the upper part of the thigh; it was circumscribed, pulsating, and communicating a thrill to the ear. Its pulsation was controlled by pressing the external iliac artery; the popliteal beat freely. Arterial hæmorrhage returned on the seventh day. Mr. Smith being summoned, most correctly diagnosed a wound of some artery, probably the profunda, not the femoral. *The external iliac artery was tied.* Everything went on well for a month, although the original wound sloughed. The ligature came away, and the wound of the operation healed; but on the thirty-fifth day from the operation, and forty second from the injury, the original wound bled again. *It bled again profusely on the fifty-ninth and sixty-third day (from the injury)*; and on the last-mentioned day Mr Smith again operated, by enlarging the original wound, and at a great depth, and under circumstances of great difficulty, securing the vessel originally wounded, which was either the profunda or external circumflex. In another month the patient was well.

It is possible that a diffused aneurysm may be mistaken for a rapidly-growing cancer. A man may meet with a blow on the thigh, causing pain and swelling. The swelling does not subside: on the contrary it continues slowly to increase; evidently infiltrates the whole tissues of the limb; is somewhat elastic, perhaps displays feeble pulsation at parts; punctured with a grooved needle yields serum or blood. The case is supposed to be *malignant*, and amputation hopeless; the patient sinks. After death there is found no cancer, but a great collection of blood, fluid or coagulated, amongst all the deep muscles, and proceeding from a small artery that had been ruptured by the blow. An incision would have revealed the mystery.

II. The FALSE or TRAUMATIC aneurysm is said to exist when the lymph, by which a puncture in an artery has been united, yields to the pressure of the blood, and dilates into a sac. This is to be treated like the last case, by two ligatures; one immediately above, the other below the wounded part, if careful compression fails to effect a cure.

III. ANEURYSMAL VARIX is produced when an artery is punctured through a vein (the brachial artery through the median basilic vein at the bend of the elbow, for instance), and they adhere together, the communication between them remaining permanent. The consequence is, that blood passes from the artery into the vein at each beat of the pulse, causing it to become enlarged and tortuous, and to present a vibrating thrill at each pulse.

IV. VARICOSE ANEURYSM is said to exist when an artery has also been punctured through a vein, and a false aneurysm has formed between them, opening into both, and formed of lymph that was effused between them. The difference between *aneurysmal varix* and *varicose aneurysm* (which is a cause of perplexity to young students) is this: aneurysmal *varix* is a swelling of a vein, caused by the admission of arterial blood into it. Varicose *aneurysm* is the same thing, but with the addition of a false aneurysm, situated between the artery and vein. These two cases need not be interfered with unless they enlarge rapidly, or cause inconvenience. If they do, a ligature must be placed both above and below the wounded part of the artery.

SECTION IV.—THE HÆMORRHAGIC DIATHESIS.

THE HÆMORRHAGIC DIATHESIS is a peculiar constitutional defect, which seems to consist in a want of contractility of the arteries, and of coagulability of the blood; so that the slightest wound bleeds almost uncontrollably, and life may be lost through the most trifling injury or surgical operation. If the existence of this diathesis be ascertained, surgeons would do well to refrain from operations with the knife on the individual possessing it. In a case of congenital phymosis, in a person of this kind, which fell under Mr. Liston's care, he very judiciously employed the ligature instead of the knife. This diathesis often runs in families. Thus the history is recorded of four children who were born of healthy parents: their skins were white and complexions fair; they were very subject to fever with ecchymosis; their blood was very fluid, but coagulated in the usual manner; violent coughing easily produced hæmoptysis or epistaxis, and any slight injury caused ecchymosis of the skin. One died at twenty months from biting his tongue; another at eight years from general mucous hæmorrhage; and a third at twelve from epistaxis. In a case of obstinate bleeding of this kind, pressure and the nitrate of silver locally, and a nutritious diet with iron or the acetate of lead and opium, or gallic acid, or turpentine in very small doses, F. 74, seem to be the most hopeful remedies.[*] Of course in such cases as these it would be a great absurdity to tie an arterial trunk at a distance, though the mistake has been committed.

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* John Bell, Discourses on Nature and Cure of Wounds, Edinburgh, 1800, vol. i., p. 75.

SECTION V.—DEGENERATION AND INFLAMMATION OF ARTERIES.[†]

I. DEGENERATION of the arteries is a very common affection in advanced life, and is the cause not only of rupture, dilatation, and aneurysm, but probably of the dry gangrene of the aged, of softening of the brain, and of apoplexy. The first step in the process, in the larger arteries, seems to be thickening of the innermost coat in patches of variable size, by a deposit of fibrine from the blood, which gradually becomes of considerable density, and quite incorporated with the vessel. The next step seems to be, the fatty degeneration of this fibrine into a so-called *atheromatous*, or pappy mass, which, examined microscopically, is seen to consist of oil-globules, cholesterine, amorphous fragments, and earthy crystals. Then the fibrous coat becomes thin and loses its structural character, and also undergoes fatty degeneration; meanwhile the outer or cellular coat becomes thickened and vascular, as if from chronic inflammation.

Instead of the fatty, the fibrine and coats of the vessel may undergo calcareous, or so-called ossific degeneration; producing specks, or rings, or projecting spicula of calcareous matter, or even converting the vessel into a rigid earthen tube.

In the smaller vessels, especially of the brain, the middle coat loses its structural marks, and becomes studded with oil-globules or with earthy particles.

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[*] Vide Brit. and For. Med. Rev., Jan. 1840; and two valuable papers by Dr. Allan of the Haslar Hospital, and Mr. Miller of Edinburgh, in Dr. Cormack's Journal for June and July, 1842.

[†] Guthrie, op. cit.; Mayo, Pathol., p. 447; Copland, Dict. *Art.* Arteries; Hodgson on Diseases of Arteries, Lond. 1815, p. 5; Gulliver, M. C. T. xxv.; Brodie's Lectures; Edwards Crisp on the Structure, Diseases, and Injuries of the Blood-Vessels, Lond. 1847; Descriptive Catalogue of Pathological Specimens, in Museum of Royal Coll. of Surgeons, vol. iii.

II. INFLAMMATION of the arteries, when acute, is probably a blood disease, and as closely allied to rheumatism as inflammation of the heart is. There are two things to be distinguished in it: 1. Changes in the arterial trunks themselves. 2. The deposition of fibrine from the blood within; and what exact relation these two elements have to each other is not yet quite certain. The *symptoms* are, tenderness and swelling of the affected artery, violent pain and numbness of the parts supplied by it, and tendency to gangrene. The author some time since treated a young man for dysentery, and, during convalescence, the axillary artery in the last part of its course suddenly became swelled and painful, and the hand cold, with no pulse. The patient was treated with small doses of mercury, and the circulation was completely restored in three weeks. Dr. Crisp relates several cases of far greater severity. A girl, aged 22, suffered from violent fever, fainting, profuse perspirations, great pain in the limbs, and tenderness in the course of the arteries. After some days, no pulse could be felt in the axillary from an inch below the clavicle, or in the popliteal. Both feet became gangrenous, especially the left, which was amputated below the knee eight months afterwards: at the time of the operation no pulse could be felt in any of the extremities. Very little blood came from the larger arteries, and that not *per saltum*, but the smaller vessels bled profusely. On examination of the leg, the arteries seemed smaller than natural, but not otherwise diseased. In another case, the patient died with rheumatism and diseased heart; the brachial artery was enlarged and plugged with fibrine. In the dry gangrene of the aged, the main artery sometimes, but not always, contains solid fibrine. In a case, recorded in the Provincial Medical Journal, 23rd April, 1842, sudden obliteration of the left axillary artery, with intense pain and numbness of the arm, and sloughing of the end of one finger, followed the hæmorrhage of abortion in a young lady of 24.

The treatment of these cases will probably consist in moderate purgatives, opium, and small doses of mercury or of colchicum, with alkalis; but one practical hint to be derived from our knowledge of this complaint is, that, in any case of *spontaneous gangrene*, we should not be too hasty in treating it as a case of debility, by local and general stimulants, till the condition of the arteries has been well examined.

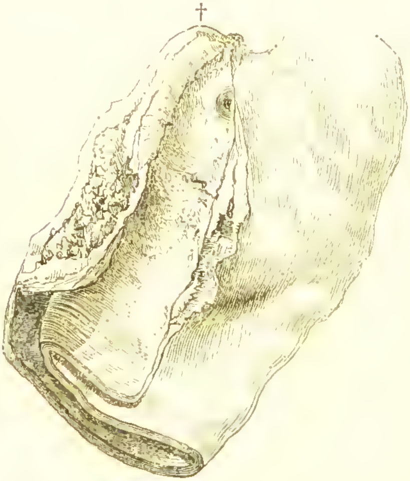
Chronic Arteritis may be supposed to be an occasional accompaniment of degeneration of arteries.

III. OCCLUSION of arteries by lymph. We introduce this paragraph in order that the student may be aware of the fact that the larger vessels may be plugged with deposits of fibrine, and likewise that portions of fibrine, detached from the walls of the heart, may find their way into the circulation, and may be arrested in, and block up, various blood-vessels, stopping off the current of blood, and giving rise to very serious consequences; for instance, to softening of the brain, if either of the cerebral arteries should be the seat of obstruction; or to the disorganization of organs by the plugging of smaller arteries; or, again, to the production of *pyæmia*, through the disintegration of the separated fibrine, and the admixture of its decomposing particles with the blood.[*]

SECTION VI.—ANEURYSM.

Definition.—An aneurysm is a sac filled with blood, and communicating with an artery, by the rupture or dilatation of which it has been produced.

Varieties.—In the first place, a distinction must be made between *aneurysm*, which consists of a dilatation of an artery, for a *part only* of its circumference; and the *general dilatation*, which consists of a bulbous expansion of all the arterial tunics for the whole of their circumference, and which differs from true aneurysm in containing no *laminated coagula*.



The *true* aneurysm consists of a sac formed by one or more of the arterial tunics. The *false* and diffused aneurysms, so called, which result from wounds of arteries, have been described in the 3rd section of this chapter. Besides these kinds, authors speak of a *sacculated* aneurysm; that is, one which is formed into pouches by an unequal dilatation of its parietes; and of a *dissecting* aneurysm, that is to say, one in which the blood finds its way between the arterial tunics, and may even open into the artery at another part.

Pathology.—Aneurysm generally commences by a giving way of the internal and middle coats of the artery at the site of some atheromatous spot, after which the pressure of the blood dilates the external or cellular coat into a pouch. This mode of origin is evident from the distinct, rounded, circumscribed opening by which most aneurysms communicate with the artery. It may also commence by a dilatation of all three of the tunics at some diseased spot. Sometimes the wound of the inner and middle coats produced by a ligature has produced aneurysm at the part tied.† Sometimes, again, as in a case that happened to Mr. Liston, an artery ulcerates and opens into a contiguous abscess, the sac of which becomes the sac of the aneurysm. Let the aneurysm, however, begin as it may, it gradually dilates under the constant pressure of the heart's impulse. It soon becomes lined with coagula, deposited in distinct concentric laminæ, of which the outer ones are the palest and firmest; and whether it was originally formed of all the three tunics or not, certain it is, that the inner two soon waste and disappear.

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[*] W. Senhouse Kirkes, M.D., on Detachment of Fibrinous Deposits, &c., Med. Chir. Trans., vol. xxxv.

[†] An incipient aneurysm of the arch of the aorta. The portion of artery represented is slit up, so as to show the cut edges, with the atheromatous deposit between the coats of the vessel.

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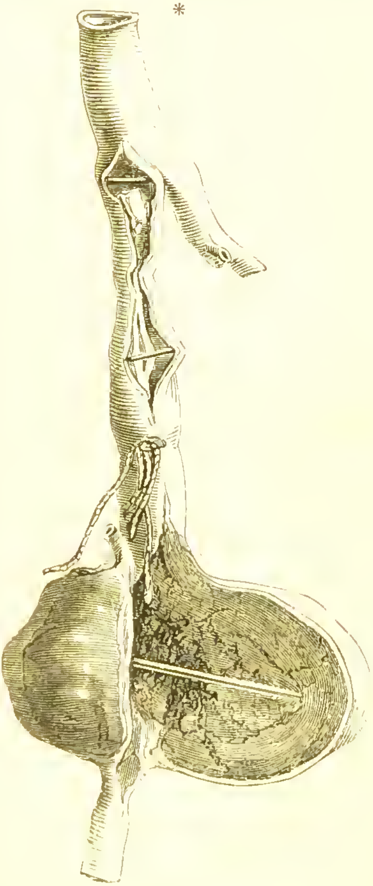

Symptoms.—If an aneurysm be seated in the neck or limbs, it appears as a tumour in the course of an artery, and pulsating with it. By the stethoscope, a blowing sound will probably be heard at each pulsation. If it be small, and not filled with coagulum, pressure on the artery above will render it flaccid, and it may be emptied by further pressure; and the blood returns into it afterwards with a peculiar vibratory thrill or *bruissement*. The patient will very often say that it commenced after some violent strain, when something appeared to give way. The first thing usually felt is a pulsation; then a tumour, not painful at first, but gradually becoming excessively so from its pressure as it enlarges. The neuralgic pain, caused by the stretching of nerves by an increasing aneurysm, is often most excruciating. In the chest, aneurysm will be principally known by an unnatural pulsation felt by the patient, and detectable by the stethoscope; together with symptoms of disordered circulation and respiration. In the abdomen, an aneurysmal tumour may be felt through the parietes.

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* This drawing exhibits an aneurysm of the common femoral artery, for which the external iliac was tied by Sir B. Brodie. The ligature is seen imbedded in lymph; the coagulum in the artery above and below it; and the laminated coagula in the aneurysm. From the Museum of St. George's Hospital.

† Paul Broca, *Sur les Anevrysmes*, Paris, 1856, p. 41.

Diagnosis.—Tumours situated over arteries, and receiving pulsation from them, may be distinguished from aneurysm by noticing, 1st. That they do not pulsate at first, when they are small; whereas aneurysms do so from their earliest formation. 2ndly. That a tumour may often be lifted up from the artery, and that then it will cease to pulsate. 3rdly. That aneurysms are generally soft at first, and become hard subsequently; tumours are generally the reverse. 4thly. That tumours *cannot be emptied by pressure;* and that no alteration is made in their consistence by compressing the artery above. 5thly. *Enlarged lobes of the thyroid gland* may be distinguished from aneurysm of the carotid by their slipping up out of the fingers, along with the larynx, in the act of deglutition. 6thly. *Psoas abscess* may be known from aneurysm by the precursory pain and weakness in the back; and by its disappearance when the patient lies down. 7thly. Pulsating tumours composed of *erectile* or of cancerous *growths*—especially those connected with bone—are sometimes mistaken for aneurysms; from which, in fact, it may be hardly possible to distinguish them during life, since they may have the same kind of pulsation, attended with the same whizzing noise, and checked, like that of aneurysm, by pressure on the artery above. The mistake, however, is of no very serious consequence, because the ligature of the main artery, which would cure an aneurysm, might check the growth of a tumour.

Progress.—As an aneurysm enlarges, its coats become thinner, but are strengthened by the adhesion of the parts around. As the enlargement proceeds, these are gradually absorbed; bone offers no resistance, but is absorbed as well; and at last the tumour reaches the skin and distends it. Inflammation succeeds; the skin becomes red, then livid and vesicated; and sloughs. When the edge of the slough separates, a fatal bleeding ensues; sometimes in a gush enough to destroy life at once, although more frequently the blood oozes away slowly. But an aneurysm may burst into a mucous canal; or into a serous cavity; or into a vein, with, of course, a fatal disturbance of the circulation if the vein is large; or into the cellular tissue of a limb; or it may cause death through its pressure on the trachea or œsophagus; or through the pain and irritation created by its compressing nerves or interfering with the abdominal viscera, without bursting. We may observe, that when an aneurysm opens into a mucous canal (as shown in the following figure), it is usually by a small round ulcerated spot. not by a slough, as in the skin; when it bursts into a serous cavity, it is generally by a crack or fissure.

Causes.—The *predisposing* cause of aneurysm is some pre-existing degeneration of the arteries. The *exciting cause* may be, strong emotion of the mind, violent exertion of the body, or local injury.

Fig. 1.*

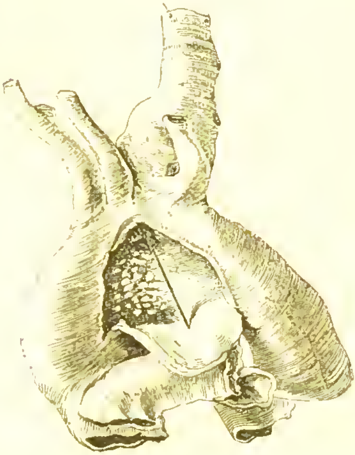
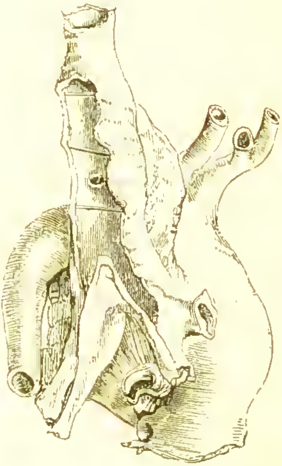


Fig. 2.



Men are very much more subject to it than women; and it is especially a disease of middle life, being most frequent between the ages of thirty and fifty, although Mr. Syme has met with it in children of seven and eight.

Situation.—The most favourite situation of aneurysms is in the aorta, near the heart; but if aneurysms of the aorta are excluded from our consideration (since they are not to be relieved by any surgical interference), we shall find that, of all the arteries of the limbs, the popliteal is the most frequently affected. Thus, out of 179 cases of spontaneous aneurysm collected by Lisfranc (not including any of the aorta), there were 59 of the popliteal artery; 26 of the femoral in the groin, and 18 in the femoral at other parts; 17 of the carotid; 16 of the subclavian; 14 of the axillary; 5 of the external iliac; 4 of the innominata; 3 of the brachial, common iliac, and anterior tibial, respectively; 2 of the gluteal, internal iliac, and temporal, respectively; and 1 of the ulnar, perinæal, internal carotid, radial, and palmar arch, respectively.

Dissecting Aneurysm.—This variety of aneurysm begins with ulceration of the lining membrane of an artery at some diseased spot, in such a way that the blood penetrates between the arterial tunics, splitting them up, and making false passages between them. In this way very anomalous symptoms may be produced, of which no better example can be desired than is afforded by a case of Dr. Todd's, related in the 27th volume of the Med. Chir. Transactions. In this case, ulceration had taken place in the aorta, and this was the starting-point of a splitting up of the middle arterial tunic, which extended upwards through the innominata into the right carotid, and partly into the left, and downwards nearly as low as the kidneys. The getting in of the blood between the coats of the arteries stopped the circulation through the proper canal of the vessels; and caused softening of the anterior portion of the right hemisphere of the brain by depriving it of its supply of blood; besides suppression of urine, and other symptoms that would have been almost inexplicable, unless a post-mortem examination had been performed.

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* Figure 1 exhibits a front, and Fig. 2 a back view of an aneurysm of the arch of the aorta, which burst into the trachea. From Mr. Lane's Museum.

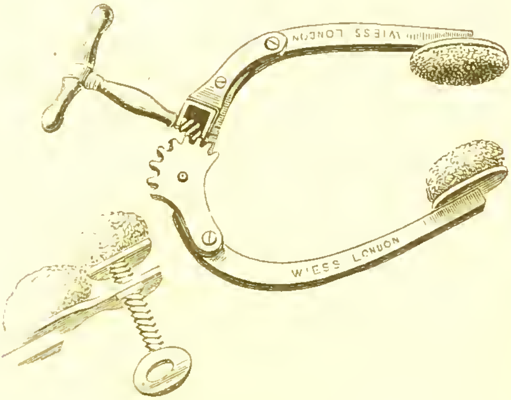
Spontaneous Cure.—Every aneurysm does not pursue the fatal course we have described, but in a small number of cases a spontaneous cure is produced. 1st. The most natural and obvious, although unhappily a very infrequent mode of cure, occurs, when a laminated coagulum lines the sac, in sufficient quantity to resist further dilatation; or conversely, when the propulsion of blood into the tumour is so languid as to allow of the formation and solidification of that clot. And here we must observe that a distinction is to be made between an *active* and a *passive* clot. The *active* consists solely of fibrine slowly deposited from the blood on the unnatural surface, and tending to remain permanently as a false membrane, and to check the disease; and the formation of this is promoted, as we have just said, by everything that renders the circulation *languid*, without stopping it altogether. The *passive* clot, on the contrary, is a mass of coagulated blood, such as may be produced by cutting off any quantity of blood from the circulation, as in ecchymosis; and this, as we have shown before (p. 23), is rarely susceptible of becoming organised, but usually is dissolved and absorbed: or not seldom gives rise to suppuration and is discharged. Yet a *second* mode of spontaneous cure is sometimes found to be caused by violent inflammation or abscess, in which the aneurysm and artery are involved; so that the blood in the sac is made to coagulate, and the artery obstructed by coagulum. 3rdly. It has happened, in a few lucky cases, that a portion of clot has been detached from the interior of the sac by some accidental violence, and has effected a cure by blocking up the opening into the aneurysm. 4thly. The artery has become obliterated by an accidental pressure of the aneurysm upon it; or by the pressure of blood escaping from it on its bursting into the cellular tissue.

Treatment.—The indications are to imitate the natural modes of cure, and especially the first.

1. *By Compression.* This very simple and obvious mode of treatment was employed long since by Guattani and others, and with some degree of success; but it was usually applied *immediately* on the aneurysm itself, and was both imperfect and violent, so that it more frequently failed than succeeded, and often caused considerable mischief. During

the last few years, however, it has been revived by the Dublin surgeons, Hutton, Cusack, and Bellingham, and has been rendered so safe, painless, and speedy a remedy, that it ought to supersede the ligature in popliteal aneurysm, and, in fact, in any case whatever in which it can be applied. And it is used *mediately;* that is, on the sound artery between the aneurysm and the heart; and in such a way as to retard the circulation and so cause an *active* clot; not to stop it suddenly, and so produce a passive clot.

The instrument employed to cause the pressure, may be either Signoroni's tourniquet (shown in the adjoining sketch)—an arc of steel, with a joint in the middle, and a screw by which the extremities of the instrument are pressed together; or else a solid clamp of steel, having a wooden splint at one end, and a pad with a screw at the other. But as these are liable to slip, Carte's circular tourniquet, which envelops the whole pelvis firmly, and in which the severity of the pressure is mitigated by India-rubber bands, is the favourite instrument at present. In some cases a common four-pound weight may be placed over the artery in the groin, with a pad intervening; or the pressure may be effected by the fingers.



The *advantages* of compression are, that it can be discontinued in a moment should it appear expedient; and that there is no chance of that severe and frequent accident of the ligature—secondary hæmorrhage: and that should it fail, the knife can still be resorted to.

The *objections* which have been urged against it are, that in some cases the patient, from irritability of system, cannot bear it for a sufficient length of time to produce a cure; and that inflammation and sloughing of the integuments may ensue, especially if there is a debility of the circulation, and a want of vitality in the skin.

Compression is *contraindicated* when the integuments are inflamed, or the limb much swelled, or the aneurysm diffused; and likewise in cases which are very rapidly increasing, for there is always a danger of the tumour bursting, or of the limb below becoming mortified. In such cases the ligature must be applied. And if, *during* the course of treatment by pressure, such circumstances should suddenly arise, it must be at once remitted, and immediate recourse had to ligature of the vessel above.

The patient, before undergoing this treatment, should be purged, and during it he must be confined to bed; the excretions by stool and urine be kept up by aperients and salines; the diet be moderate; and pain and restlessness be allayed by opium. The skin at the part pressed should be shaved, if necessary, and be well powdered with French chalk. The pressure should not be severe enough to cause great pain; and it may be applied at two or three points, in the course of the femoral artery, being shifted, when it becomes irksome, from one to another. This may be left to the patient himself, if intelligent and made acquainted with the exact object of the process; but he must be cautioned of the danger of sloughing from too violent compression. It may generally be left off at night. If the case goes on favourably, the aneurysm is, after a time, found to have lost its pulsation, and to have become solid. This happy event may occur in three or six days, or perhaps may require as many weeks; after which the tumour wastes slowly, and the limb may be brought into use again.

In cases which do not admit of pressure being applied *mediately*, it may be tried cautiously on the tumour itself, or upon the artery below it. Cases are recorded which give room for hope from such measures.*

Continued Flexion of the knee-joint has produced a cure of popliteal aneurysm in the hands of Mr. Ernest Hart and Mr. Shaw.†

2. *By Ligature.*—In cases in which the above plan is inapplicable or unavailing, the artery must be tied between the aneurysm and the heart. The operation should be performed neither too near the aneurysm, so as to place the ligature on a portion of the vessel that is diseased, nor too far from it, lest the circulation through it be kept up by means of collateral branches. After the operation, the temperature of the limb falls two or three degrees; but in a few hours it rises rather higher than that of the opposite limb, because the blood is forced to circulate through the superficial capillaries. Subsequently it sinks again rather below the natural standard. Therefore the patient should be placed in bed, with his limb in an easy position; wrapped up, to

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* For the earlier cases, see Dr. O. B. Bellingham, Dublin Journal, May 1845; Greatrex and Robinson, M. C. T., vol. xxviii.; Carte, Dublin, Med. Press, May 16, 1849; case of axillary aneurism cured by compression on the distal side, by Dr. M. Goldsmith, of America, ib.; for the later, Bellingham, Med. Chir. Trans., xxxiv.; and cases by Tuffnell, Cock, B. Phillips, and others, in Ranking, vol. xvii. For a summary of objections see Mr. Syme's Contributions.

† Med. Times, May 7, 1859.

preserve its circulation; and though it become rather swelled (which is not unlikely), cold must on no account be applied.

After the operation the limb may become gangrenous. If the gangrene spread beyond the fingers or toes, amputation should be performed above the level of the ligature.

Brasdor's operation.—When a ligature cannot be applied—as in aneurysm of the carotid, innominata, or subclavian—between the aneurysm and the heart, it has been proposed to tie the vessel on the distal side; and this operation has been performed with success in cases of carotid aneurysm, by Mr. Wardrop and others.

3. *Fergusson's Treatment by Manipulation.*—In two cases of aneurysm of the right subclavian artery, between the scaleni, Mr. Fergusson instead of trying the hopeless operation of ligature between the tumour and the heart, or the very doubtful one of ligature on the distal side, endeavoured to block up the artery, by fibrine squeezed from the sac. He first emptied the sac by pressure with his thumb, then deliberately squeezed and rubbed the opposed surfaces against each other, so as to force some of the fibrine into the artery. The effect in each case was immediate and striking. In the first case there was giddiness, in the second partial hemiplegia, rendering it probable that some particles of fibrine had been carried up to the brain; in the first, after one or two repetitions of the manipulation, all circulation in the vessel and its branches below was arrested, and the tumour became smaller and firmer. Nevertheless after some considerable exertion, it burst into the brachial plexus, and the patient died seven months after the first manipulation. In the second case (in which, by the way, all pulsation had ceased from the arteries below for some months before the manipulation) the tumour became gradually less, and the man was alive and well two years afterwards.

4. Various modes of cure have been from time to time proposed on the principle of causing *coagulation of the blood in the sac.* The most hopeful of these, is the injection of a solution of basic perchloride of iron, of the strength from 15 to 20 degrees of Beaume's Areometer; by means of a fine trochar and canula with which the sac is punctured; and by means of a syringe, the fine nozzle of which fits into the canula after the trochar is withdrawn. The piston is depressed by a screw, each turn of which causes one drop of liquid to exude; and during the operation, the artery should be compressed above, and the tumour be gently handled, so as to mix the perchloride with the blood as rapidly as possible. If it succeeds, the tumour is converted into a solid mass, and a little serum only exudes from the puncture.*

5. *Medical Treatment.*—In cases in which an operation is impossible the great object is to keep the circulation tranquil, without reducing the

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* For an account of the older plans of causing coagulation, such as Sir E. Home's heated needle, the introduction of threads, and galvano-puncture, see South's Chelius, vol. ii. See also M. Pravaz's plan of injecting the perchloride of iron, Lancet, 1853, vol. i. p. 561; Fergusson's Surgery, 3rd ed., p. 638; Broca, op. cit.

strength. The nervous system should be tranquillized by *opium*, or tobacco-smoking. *Bleeding* may be performed occasionally, if the patient is plethoric, and the tumour increases rapidly, with violent pulsation; but it should never be carried to faintness. The *diet* should be light. *Bodily* or *mental excitement* should be rigidly abstained from. *Digitalis* and *tartar-emetic* are of questionable propriety. The *acetate of lead*, F. 75, is said to have the faculty of rendering the blood coagulable, and of diminishing the calibre of the arteries. It used to be mentioned in terms of commendation by Mr. Green, in his lectures at King's College, who gave some instances of its efficacy.* But it must be recollected that *frequent bleeding* and too *rigid starvation* will increase the irritability of the heart and arteries. Particular care should be taken not to administer drastic purgatives; because they invariably cause a great excitement and throbbing of the arteries.

SECTION VII.—VASCULAR TUMOURS.

The VASCULAR TUMOUR (*Nævus*, *Erectile Tumour*, *Telangeiectasis*) consists, *anatomically*, of enlarged and dilated blood-vessels. It seems to consist in an overgrowth of these organs, and may affect capillaries, arteries, or veins, together or separately. In most cases there is a mass of dilated capillaries, inextricably packed together; and on a section, the great dilatation of the vessels, and the small quantity of intervening tissue, causes them to resemble a collection of cells rather than of tubes. In some instances the arterial character predominates; the tumour, if situated in the skin, being of a vivid scarlet, and pulsating strongly; in others, it is of a most dusky hue and venous character. In some instances, again, the affection seems to be confined to the larger blood-vessels, with little, if any, implication of the smaller ones. If the arteries are affected (as shown in the following figure) the tumour (which is sometimes designated *aneurysm by anastomosis*) is tense and pulsates vividly; if the veins, they feel like a bunch of earth-worms, and are easily emptied.

The most frequent *situations* are the skin, and subcutaneous cellular tissue, especially about the head. It has been found in bone. The *causes* are unknown. The disease is usually congenital. The vulgar idea is, that a lobster, or raspberry, or some such thing has been longed for by the mother, and that the influence of her mind has impressed on the fœtus the image of the thing she longed for. It may originate, however, later in life.

Symptoms.—Nævus of the skin may present itself as a mere red speck or patch, or as a soft raised swelling, dusky or scarlet, according as it is arterial or venous. The subcutaneous nævus feels soft, and very much like a fatty tumour, except that firm pressure will usually cause it to be emptied and to disappear. "Some of these tumours," says Mr. Liston, "communicate a thrill to the fingers; they can be emptied to a certain extent, by uniform and continued pressure, or by interrupting the circulation, and are instantly filled on permitting the blood again to flow into or towards them. The large ones pulsate synchronous with the heart's action. They are much increased in size by anything that increases the activity of the circulation; as the cries of children, and the violent exertion ot adults. On the application of the stethoscope, pulsation is heard as in common aneurysmal tumours, and a sound which differs from that of the common aneurysm, being loud, rough, and whizzing, and which being once heard can never be mistaken."

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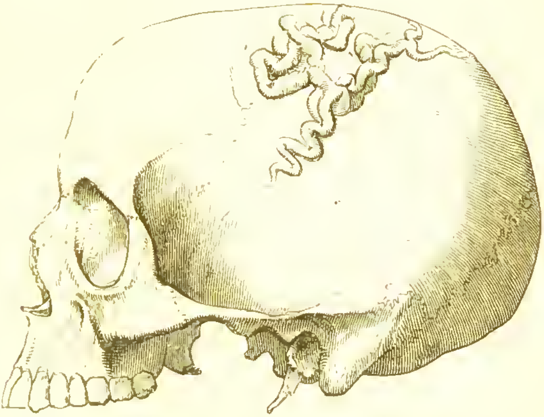
* See also a case of aneurysm of aorta cured by acetate of lead in large doses, Arch. Gen. de Med., Sept. 1839; see Mr. Fergusson's papers, Med. Chir. Trans., vol. xl.



Diagnosis.—These tumours are distinguished from fatty growths by the signs which have just been described; and from vascular cancers, by their long continuance without deranging the health.

Consequences.—The author has seen many cases of congenital vascular tumours waste spontaneously during the first few months or years of life, and give no further trouble. In other instances they increase to a certain size, and then become stationary, or waste, leaving, perhaps, certain cysts containing blood or a reddish serum, as the remains of cells and pouches formed by distended vessels. In other cases, again, they increase rapidly, invade every adjoining tissue; ulcerate or slough at the most prominent parts; and so may destroy life by hæmorrhage, or keep it in constant danger. The tumour composed of dilated veins is a very different thing from varix, inasmuch as it spreads in a manner showing it to be quite uninfluenced by the weight of the column of blood. In one patient the author has seen a cluster of dilated veins, the size of a walnut, under the skin of the calf of the leg. This has been stationary since birth. In another case of a middle-aged woman, the author has seen this condition begin and extend rapidly from under the heel, up the calf of the leg to the ham. There was a great hypertrophy of skin, and under it, large clusters of dilated veins.

Treatment.—The cure of these diseases may be effected—1, by measures which retard the circulation through the enlarged vessels; or which cause the blood to coagulate, or which excite the adhesive inflammation, and so to obliterate or disorganize the distended vessels; or, 2, by extirpation with the ligature or knife. The former class of remedies is best adapted for nævi under the skin, the latter for those which implicate the skin itself.

Of the former class the best remedy is the *seton;* and the best way of using it is to pass several threads with a common sewing-needle, in different directions across the tumour, withdraw them so soon as they have excited suppuration, and then pass others through other parts of the tumour. If a larger needle is used, it should be straight and flat, with sharp edges, and should be made to drag as much silk as it can possibly carry, so as to fill the wound, and prevent hæmorrhage. Some surgeons dip the threads in croton oil, or in a solution of lunar caustic, but this seems unnecessary. On a similar principle the nævus may be *punctured* with the point of a lancet, and a fine probe which has been dipped in melted nitrate of silver, or a needle heated to a black heat, may be passed through it in various directions, or Marshall's galvanic cautery may be employed for this purpose; or its substance may be simply broken up with a cataract-needle. *Pressure* by means of a smooth surface of ivory or sheet-lead, confined by strips of plaster and a bandage, is a good remedy, if the nævus is small and situated over a bone, so that it can be applied uniformly and effectually. Mr. Fergusson sometimes passes a needle under a small nævus, and twists a thread over it, so as to cause considerable pressure, allowing it to remain for forty-eight hours or longer, after the manner used for the relief of varicose veins. *Congelation*, after Dr. James Arnott's method, will sometimes check the growth of a nævus. The *injection* of an astringent fluid, by means of Anel's syringe, was proposed some time since, and a solution of sulphate of zinc, so employed, caused the patient's death by convulsions. The obvious conditions necessary for the safety of this plan are—that the liquid employed shall not be poisonous in itself; that it shall be capable of at once curdling the blood, so that there may be no chance of its being diffused through the circulation; and that it shall not cause abscess or render the clot incapable of being afterwards absorbed with safety. The neutral solution of perchloride of iron, recommended by Pravaz, may be employed; but experiments are wanting to decide upon the substance most suitable. Probably a solution of matico or some astringent vegetable might answer. Mr. Haynes Walton has used a solution of *tannin* with success in a case of nævus of the orbit. The solution of perchloride of iron has been used with success by Mr. W. Adams in a case of traumatic aneurysm; and Dr. Brainard, of Illinois, has published a case in which, after ligature of the common carotid had failed, he produced a cure of a rapidly-increasing nævus of the orbit by injecting a solution of 8 grains of lactate of iron in a fluid drachm of water. *Vaccination* has also been used for this disease; but it requires that the whole surface of the tumour and some of the skin around should be inoculated, so as to cover it with a confluent vesicle, which excites great fever; and the opportunity of doing so must be rare. A very small nævus may also be destroyed by puncturing it, and inserting into the puncture a glass pen dipped in *nitric acid:* this is also a good method of removing little red spots on the face, formed by a distended vessel with radiating branches; but immediately after applying the acid, the part should be sponged with a solution of carbonate of soda, to prevent any scar on the skin.

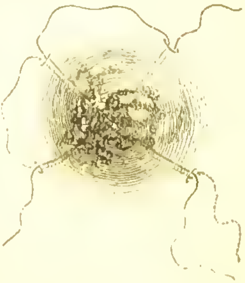
The *tumour composed of dilated veins* is best treated by subcutaneous incision, so as to divide it in several places, and by continued bandaging. If small, and not growing, it should not be meddled with.

Extirpation of these tumours is practicable only when they are of the cutaneous variety, or when they can be lifted up from the parts beneath, so that their whole extent can be ascertained. If it is done with the knife, two elliptical incisions should be made, to include the whole of the diseased growth, and a little of the sound tissues around. For, to use Mr. Guthrie's words, "it cannot be too forcibly impressed on the mind of the surgeon, that if the diseased part be cut *into*, the bleeding will be terrific and difficult to stop."

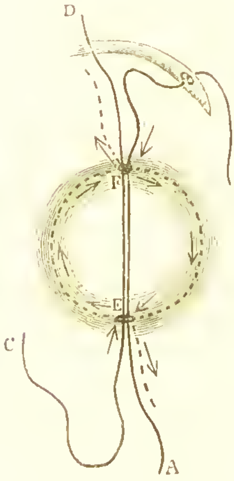
But it is generally considered that the *ligature* is the safest and best method. With this proviso, that *skin* should not be included in a ligature and allowed to ulcerate; but that it should either be dissected back in flaps from the tumour, before the latter is tied; or that, if this is not done, a cut should be made through the skin for the ligatures to lie in;—or that the ligatures should be passed under the skin, so as to strangulate the morbid growth, and leave the skin untouched.

One mode is to pass two or three needles crucially through the base of the tumour, and then twist a strong twine ligature firmly round beneath them.

Or, two or more double ligatures may be passed through the base of the tumour, with a curved needle which has its eye at its pointed extremity (p. 129), and then the tumour may be strangulated by tying the adjacent threads together.



Or, the knot devised by Mr. Fergusson, represented in the adjoining figure, may be used. A double thread is thrust transversely under the centre of the tumour, and divided in the middle. Next, one end of the thread is passed through the eye of the long needle (with the eye near its point, shown at p. 129), and, having been brought one-fourth round the circumference of the tumour, is thrust transversely through its base. Then it is to be disengaged from the eye of the needle, and the other thread to be put into the eye, and to be carried back with it. Lastly, the adjoining ends of the two threads are to be tied tightly; so that each of the two threads shall include an 8-shaped portion of the tumour. The tumour may be punctured before the threads are finally tightened; and in every case the constriction should be made as tight as possible. After two or three days the ligatures should be tightened, or fresh ones should be applied. In each of these cases, the skin should be cut through just before the threads are tightened, so as to make a chink for them to lie in, and to avoid the pain and delay of ulceration through the skin.



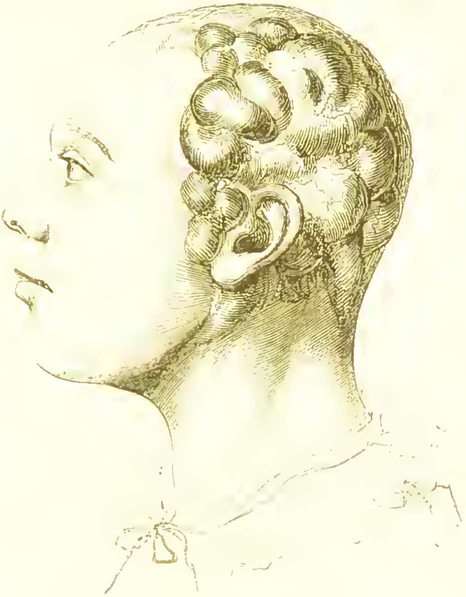
Or, the same needle, armed with stout twine, may be passed right under the middle of the tumour, and be withdrawn; next, the ligature which has been passed, is divided in the middle into two threads, A B and C D. One end, B, being passed through the eye of the needle is thrust into the second wound, F, and carried semicircularly round under the skin, and brought out at the first wound, E, where it is seized and held firmly whilst the needle is withdrawn. One end, C, of the other thread, being in like manner put into the needle, is thrust in at E, and carried round under the skin on the right side, and brought out at F. The operation is completed by tying A to B, and C to D very tightly, so as to strangle the half of the base of the tumour, encircled by each respectively. The ends are to be left, and fastened with plaster, so that they may be tightened if requisite, and drawn out, as the base of the tumour perishes by ulceration.

A method analogous to extirpation is, the *division of all the soft parts around the tumour*. This was once done successfully by Mr. Lawrence, in an aneurysm by anastomosis on the finger. He divided all the soft parts, except the tendons and thecæ. But in other cases it has been unavailing.

If the disease is inaccessible to any of these means (as in the orbit) and increases rapidly, ligature of the common carotid (or of whatever other large vascular trunk supplies it) is the only resource.

The following figure represents a case of this disease, chiefly of a venous character, in a female, about thirty years of age. Mr. Storks tied the common carotid artery, with the effect of producing a marked decrease in the tumour; and the patient having been subsequently admitted into the King's College Hospital, under the care of Mr.

Fergusson, the remaining tumour was successfully treated with the needle, and ligature employed as for the cure of varicose veins.*



CHAPTER VIII.

INJURIES AND DISEASES OF VEINS.

SECTION I.—WOUNDS OF VEINS.

THE HÆMORRHAGE from wounded veins is not in general dangerous, unless from some large and deep-seated trunk, or from a large varicose vein on the leg. It may in ordinary cases be restrained by pressure and a raised position. But if there is any difficulty in the matter, it will be necessary either to apply a ligature or to keep up unremitting pressure on the bleeding point with the finger. The latter practice was resorted to "in the case of his Excellency William Prince of Orange, who, in his hurt by the Spanish boy, as my Lord Bacon relates, when the internal jugular was opened, could find no way to stop the flux of blood, till the orifice of the wound was hard compressed by men's thumbs, succeeding for their case one after the other, for the space of forty-eight hours, when it was hereby stanched."*

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* Vide Curling's Pathological Lectures in Med. Gaz., July, 1838; Lawrence, Med. Chir. Trans., ix. 216; a fatal case of convulsion during the operation for nævus by injection, Med. Gaz., vol. xxi., p. 529; J. Adair Laurie on Cricoid Aneurysm, Med. Gaz., 21st Oct. 1842. The author has also borrowed from a lecture which he heard delivered by Sir B. Brodie, at St. George's Hospital, in Nov. 1842, as well as from many clinical remarks of Mr. Fergusson's after operations in the King's College Hospital. See also Birkett, Med. Chir. Trans., vol. xxx.; Paget, Lectures on Surgical Pathology, vol. ii.; Brainard, Lancet, Aug. 20, 1853; Mr. Adams's case, Lancet, 3rd Sept. 1853; Haynes Walton, Ophthalmic Surgery *(on Nævus near to Orbit)*.

SECTION II.—INFLAMMATION OF VEINS, OR PHLEBITIS.

This is a disease, the importance of which depends on the amount of blood disorder which accompanies it. The veins themselves seem to be not particularly susceptible of inflammation; nor does that inflammation, if unaccompanied by the admixture of decomposing fluids with the circulation, seem to be particularly noxious; on the other hand, decomposing fluids, introduced into the circulation through a wounded vein, will very readily cause death, without any inflammation of the veins by which they entered. Still less without any affection of the vein spreading towards the heart, as used to be supposed. We have already, in the second Part, third chapter, and eleventh section, (p. 60), spoken of *Pyæmia*, and the constitutional affections arising from a poisoned state of the blood, which often accompany phlebitis, and are commonly spoken of as symptoms of it; though in reality, as we have said, they may exist without phlebitis, and phlebitis may exist without them.

We will draw the attention of the student to the following conclusions, which we have drawn from the researches of Mr. Henry Lee—

1. That the lining membrane of veins has a very small tendency to inflammation, and does not exude lymph as a serous membrane does. This was proved by Mr. Lee, by means of the experiment of cramming with wadding a portion of the jugular vein of an ass, from which the blood was excluded by ligatures. A similar piece of wadding was introduced into the peritonæum. After forty-four hours the ass was killed; when there was found to be abundance of lymph covering the wadding in the peritonæum; none on that in the vein.

2. That fibrine found on the lining membrane of inflamed or injured veins is deposited from the blood.

3. That pus, and other morbid fluids, mixed with healthy blood, cause it to coagulate; that if any such fluid were to find its way into a wounded vein, the blood ought, by coagulating, to seal up the vessel, and prevent it from being carried into the circulation.

4. That when a vein is filled with coagulum, thus produced by admixture with morbid matter, and containing it; if the poison is such that it ought to be eliminated, the areolar tissue around inflames, and becomes the seat of suppuration and abscess; the coats of the vein be-

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* Turner, op. cit., vol. i., p. 346.

come thickened and softened; and the clot they contain is discharged by means of the abscess thus formed.

5. That if the coagulum be disturbed; or if the poison be such as to hinder coagulation; or if, through some defect in the blood, firm coagulation does not take place; or if the coagulum once formed softens down, so as to allow the mixture of poisonous fluid with the circulating blood, certain other ill effects may follow; more particularly that general contamination of the blood to which the name *Pyæmia* is given.

1. *Idiopathic Phlebitis.*—This is not a very common disorder. The author has, however, treated a few cases, such as the following:—1. A woman, æt. thirty: several superficial veins on the outer part of left thigh, swollen, and tender; skin over them red; blood in some parts coagulated; no constitutional symptoms. 2. A girl, æt. nineteen: complained of severe pain in right knee. On examination, the pain was referred to the ham and upper part of the calf, which were swollen and tender; and there was tenderness and redness of the saphena, up the thigh; the tongue loaded; headache, thirst, and nausea. Rest, purgatives, and fomentations are the remedies for such cases; the origin of which is probably to be found in some impurity of the blood.

2. *Traumatic Phlebitis.*—When a vein is wounded, and the wound is not accurately closed, or when it is disturbed, so as to break up the commencing adhesions, and allow pus or decomposing sanies to find its way into the vessel, the first effect should be, as we have just said, the coagulation of the blood. Even then, if the blood be healthy, the part be kept at rest, and the intruding liquid small in quantity and not very noxious, no greater harm need ensue than some swelling and inflammation around the vein. But under more unfavourable conditions, the blood in the affected vein will coagulate widely; parts of the clot soften into puriform fluid; the cellular tissue in the track of the vein suppurate; the skin redden; and the vein become first thickened from infiltration, then softened, and broken down, so as to allow the clots contained to mix with the abscess around it. This process will be accompanied with considerable pain and fever; but not with pyæmia if the blood has coagulated firmly and widely enough. The *morbid anatomy* is very simple. The vein is thickened, and reddened wherever its inner surface has been in contact with clot; and it contains coagulated blood, which in the focus of the disease is decolorized, and softened into puriform fluid; and it may be besides destroyed by ulceration.

Treatment.—From the foregoing details some useful practical hints may be extracted; for instance, the expediency of the most accurate closure of all wounded veins; the great use of those old-fashioned so-called *vulnerary balsams*, such as the *Friar's Balsam*, or of the application of brandy, or collodion, or similar substances, to wounds, so as to seal them up from the atmosphere, and produce firm coagulation of the blood; the necessity of rest after a wound, so as not to disturb the coagula; the danger of great loss of blood, and of too low a diet (especially after parturition), which might render the blood incapable of firm coagulation; the fact that the abscesses about inflamed veins are truly eliminative and salutary in their character; and the questionable utility of cold lotions, leeches, and mercury, to diminish the local inflammation, which probably, as Mr. Lee remarks, is the means adopted by nature to prevent general infection of the blood. The remedial measures, then, are rest, warm fomentations, and poultices; early incision of abscesses; evacuation of bile and fæces, by one or two doses of calomel; opium, to relieve pain, and insure quiet of mind and body and wine, especially if there has been great loss of blood.

SECTION III.—VARICOSE VEINS AND PHLEBOLITES.

I. VARIX signifies an enlarged and tortuous state of the veins, which are generally thickened, rigid, and divided into irregular pouches, with their valves incapable of preventing the reflux of blood. This state is usually said to be caused by anything that retards the venous circulation; such as occupations that require a standing posture; or pressure from loaded bowels or the gravid uterus. But there must be some other cause, because varix often occurs when there is no pressure on the veins to account for it; and if produced by temporary pressure in healthy people, it subsides of itself when that pressure is removed; a fact that is familiar to practitioners in midwifery. Moreover it may exist to a great extent without causing much inconvenience; and in other cases, a very small amount of it may produce very serious evils; such as pain, soreness, aching. Hence the writer believes that in many cases the blood is primarily at fault, and that a gouty condition of this fluid, with tendency to stagnation, precedes the distension of the vein. It is most frequently *seated* in the lower extremities, scrotum, and rectum.

Varicose veins on the leg produce several troublesome consequences. 1. In the first place, they occasion great pain, weight, and fatigue upon taking much exercise, or remaining long in an erect posture. 2. They frequently cause ulcers or excoriation of the skin. 3. Sometimes a vein becomes exceedingly thin, and bursts, causing a profuse or even fatal hæmorrhage, inasmuch as there may be no valves between the part ruptured and the heart. 4. Occasional clotting of the blood occurs in the affected vein, with inflammation; which may perhaps give rise to abscess.

Treatment.—This may either be *palliative* or *radical*. The palliative consists of measures adapted to prevent further enlargement, and induce contraction of the distended veins. If one or two trunks only are affected, it may be sufficient to apply pieces of leather spread with soap-plaster firmly over them; but if many smaller veins are enlarged, the whole limb should be well supported with a calico or caoutchouc bandage, or laced stocking, which should be applied in the morning, before the patient rises. Friction with a flesh-brush is strongly recommended by Mr. Vincent; but in all cases the friction should be in the course of the blood, not against it, so as not to strain the already weakened valves. Galvanism may be of service. When the patient is not taking exercise, the leg should be placed in a raised position. But the author would call attention to the little-noticed fact, of the great aggravation of pain, weight, and swelling of the affected part, produced by inactivity of the bowels and kidneys, and of the great relief obtainable by purgatives, antiarthritic medicines, and tonics.

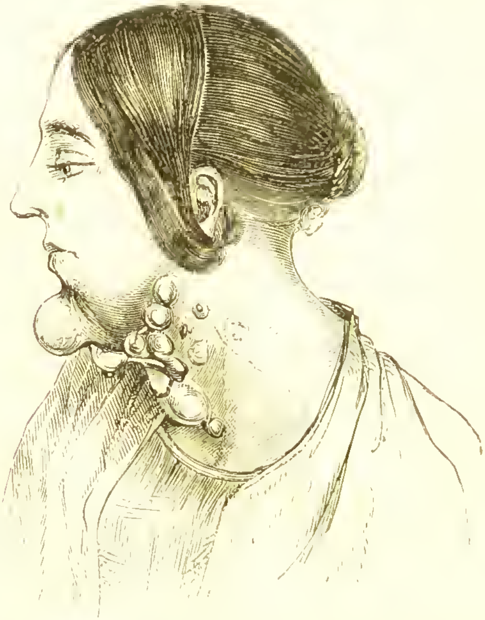
But if these means fail, and the patient is subject to urgent inconvenience, the radical cure must be resorted to; that is to say, the diseased veins must be obliterated; a proceeding which will have some prospect of success if only one or two large trunks are affected; but not if all the minor cutaneous veins are enlarged also. There are several ways of effecting this. 1st. Some years ago, Sir B. Brodie recommended division of the vein by *subcutaneous section,* in the following way. A long, curved, narrow-pointed knife, like a bistoury, but cutting on the convex edge, was introduced by the side of the vein, and carried horizontally with its flat surface between it and the skin. Then the convex edge was turned towards the vein, in order to cut through it, as the knife was withdrawn. 2ndly. Mr. Watson, of New York, recommended, in some cases, *excision* of a portion of the affected vein. Then, 3rdly, there is a method which was introduced by Mr. Cartwright, and improved by Mr. Mayo, of destroying a narrow slip of skin across the vein by a paste of *potassa fusa* and quicklime, in order to cause slight inflammation of the vein, with coagulation of the blood in it, and obliteration of its cavity. 4thly. *Pressure* by means of a firm pad and bandage may be used for the same purpose.

5thly. The *twisted suture.* The surgeon pinches up the vein between his left forefinger and thumb, and passes a needle behind it: it is a good plan also to pass another at right angles, which should be made to transfix the vein twice, and should go behind the first; a thread is then to be twisted around them tightly enough to stop the circulation; and this may be done at as many places as the surgeon thinks requisite.

The points of the needles should be cut off. They should be allowed to remain till the blood in the vein is solidified, or until they have produced slight ulceration. 6thly, Mr. H. Lee has adopted with good effect a subcutaneous section of the affected vein, at a part between two of the needles.

Both before and after any of these operations, care must be taken to avoid every cause of inflammation; because any of them may be followed by abscess or pyæmia, if precaution be neglected.*

II. PHLEBOLITES are calcareous concretions, formed by the degeneration of coagula, in dilated veins. The above figure represents a patient of Mr. Fergusson's, in whom several of these concretions formed in pouches of irregularly-dilated veins under the lower jaw. They were extirpated by the knife, which is the only remedy available.



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* Vide Arnott in Med. Chir. Trans., vol. xv.

CHAPTER IX.

INJURIES AND DISEASES OF THE NERVES.

I. COMPLETE DIVISION of a nerve produces palsy and loss of sensibility in the parts to which it is distributed. The nerve, however, will readily unite in the same manner as bone or tendon, and sensibility and motion will return. Sensibility has been known to return in one case in three weeks (in a case related by Paget in ten days), and the power of motion in four weeks, after division. A nerve may also recover its functions after a small piece of it has been removed. Sometimes, however, the divided ends, instead of uniting, shrink and become bulbous, as they do in a stump after amputation.*

II. PARTIAL DIVISION.—If a nerve is partly divided, leaving some fibres on the stretch, as sometimes happens in venesection, very disagreeable consequences may ensue, such as immediate severe pain, recurring in paroxysms, and shooting in the course of the nerves; violent spasms, or palsy of the limb; fits of epilepsy; and great disorder of the digestive organs. The same symptoms may also ensue if a nerve has been bruised, or compressed, or stretched; or if it has been divided, and its extremity has become implicated and compressed in a cicatrix. This not unfrequently happens after amputation, and produces excruciating pain, with spasm and retraction of the muscles of the stump, causing it to become conical.

Treatment.—If these symptoms come on *immediately* after a wound, so that it is probable that a nerve has been partly divided, an incision may be made so as to divide it completely. If, however, they appeared whilst a wound was healing, the best plan is to remove the cicatrix entirely. But it unfortunately happens, that neuralgic pains, when once established, do not always cease, even when the cause which produced them at first is removed. Very disagreeable consequences, in the shape of palsy, or numbness, or spasm, are sometimes caused if a nerve is subjected to pressure, as, for instance, the pressure of crutches on the axillary nerves; or from a blow, such as people often meet with on the ulnar nerve above the elbow; or from a violent stretch. Leeches, blisters, and the application of mercurial ointment, or of opiate or belladonna plasters, or painting with tincture of aconite, are the chief remedies.

III. RHEUMATIC INFLAMMATION.—In a recent case, thorough purgation by calomel, colchicum, rhubarb, and carbonate of potass, may cut short the attack. In chronic cases, the iodide of potassium, guaiacum, and other anti-rheumatic remedies, must be used according to circumstances. Lumbago and sciatica are thus treated.

IV. NEUROMA signifies a fibrous tumour developed in the sheath of a nerve. According to Dr. Van der Byl and Dr. Snow Beck it originates in an exudation around the tubules of a single fasciculus, within the neurilemma. This becomes organized into a fibrous or fibroid tumour, which enlarges and obliterates the adjacent nervous tubules by its compression.* Such tumours are smoothly globular or oval, and may vary from the size of a pin's head to that of an orange. Often they exist in great numbers in the nerves of one patient; and are painless; whilst, as we noticed in the Section on Tumours, p. 97, one single small fibrous or cartilaginous tumour, which has no visible connexion with any nerve, may be the seat of the most excruciating pain. Yet these tumours, like any other morbid condition that may exist in or about the trunks of nerves, may produce every conceivable symptom of nervous irritation. Iodine paint, externally, and iodide of potassium, internally, may be tried; but if they fail, as they most likely will, any tumour which is troublesome must be extirpated, provided that it be not intimately embedded in the substance of a large nerve, such as the sciatic, the division of which would paralyze a limb.

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* The bulbous ends of a nerve which had not united have been cut out, but without avail. Vide Sir G. Ballingall's Mil. Surg., p. 219.

V. NEURALGIA, or TIC-DOLOREUX.—This affection may be *defined* to be severe pain affecting the nerves, not necessarily produced by organic lesion. It occurs in paroxysms of very severe pain, mostly of a plunging, lancinating character, shooting in the course of the nerves. It most frequently attacks persons of middle age, female sex, and comfortable circumstances.

Causes.—The exciting causes may be of two orders. 1. There are some which act upon the nerve that is the seat of pain. Thus, neuralgia may be produced by wounds and other injuries, as before related; by tumours, especially cancer; by spicula of bone pressing on the nerve (which is a frequent cause of facial neuralgia); or by some disease in the brain or spinal cord at its origin.

2. It may be caused by states of the blood; as, for instance, by loss of blood and debility, especially if combined with torpor of the kidneys and bowels; by a gouty taint; by wet and cold; by irritation of the skin from eruptions or wounds; by carious teeth; by disorders of the alimentary canal; sometimes by diseases of the uninary or other internal organs; lastly, by *malaria*. When arising from malaria, it is generally *intermittent*, like other diseases arising from the same source, and occurs at regular intervals. But all intermittent neuralgia is not necessarily caused by malaria; because this, as well as other nervous affections, may occur only at stated periods, although caused by a local source of irritation that is permanent.

The *nature* of the complaint is apparently *functional* derangement. The suddenness of its accession and departure, and the absence of organic change in nerves that have been affected for years, prove that it is not essentially inflammatory. See pp. 11, 19.

The most common forms of neuralgia are—the *Supra-orbital Neu-*

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* See R. W. Smith, of Dublin, on Neuroma; Dublin, 1849; Van der Byl, Pathological Trans., vol. vi.

ralgia, *Brow Ague*, or *Hemicrania*, which is usually caused by malaria; neuralgia of the *superior* and *inferior maxillary* nerves, which is often caused by diseased teeth, or disease of the bony canals through which those nerves pass; and neuralgia of the ear, mamma, and testicle, which will be treated of elsewhere: it may also attack the extremities, or any internal organ.

Treatment.—The *indications* are three. *First*, to remove all sources of irritation which may affect the painful nerve, either at its origin or in any part of its course; remembering always that the painful spot is very seldom the real seat of the disease; *secondly*, to amend any disorder of the constitution that can be detected; *thirdly*, to alleviate pain.

In the *first* place, therefore, the whole course of the affected nerve should be thoroughly examined; and if there is a cicatrix, or tumour, or wound, or a carious tooth, or an abscess, or ulcer, or hernia, or aneurism, to which the pain can be attributed, measures should be taken for their removal. In cases of neuralgia of the extremities, if there is any tenderness, or other reason for suspecting inflammation of the nerve or its sheath, leeches and blisters, followed by liniments (especially F. 145, 151), applied in the course of the nerve, combined with proper constitutional remedies, may effect a cure. The head, and particularly the spine, should be well scrutinized. If there is any vertebra particularly tender, an opiate or belladonna plaster, or a plaster of ammoniacum with mercury, or, in extreme cases, the tartar-emetic ointment may be applied. This is the condition which has been described under the term *Spinal Irritation*. But the writer is more inclined to believe that this is an effect of a general nervous or hysteric condition, than an original or substantive disease in itself. The condition of the great secreting organs, as well as of the stomach, uterus, and rectum, should also be ascertained, in order to make sure that a morbid condition of one of these parts is not the real source of the evil.

Secondly. The state of the constitution must be regulated in the same manner as was directed in the treatment of chronic inflammation. If there are paleness of the lips, emaciation, and debility, iron, bark, and other tonics may be given with advantage. Inquiry should always be made in these cases for piles, menorrhagia, Bright's disease of the kidney, and other weakening ailments. On the other hand, bleeding and low diet have cured cases attended with hard full pulse and plethora. In all cases, the appetite, the tongue, the biliary and alvine secretions, and the state of the uterine system, should be investigated. In the brow ague and other cases arising from malaria, quinine should be given in doses of three grains every four hours, F. 3; if it fails, arsenic, F. 97; or the extract of nux vomica, in doses of gr. $\frac{1}{4}$ *ter die*, or guaiacum, may be tried. In cases of a rheumatic or gouty character, colchicum, F. 70, &c., may be of service. Assafœtida with aloetic purgatives and valerian may be given if there are hysterical symptoms, and sarsaparilla with iodide of potassium, F. 197, might be tried; or the hydrochlorate of ammonia, or the nitrate, if the malady has followed syphilis, or if there is any reason to suspect thickening of the bones of the skull. But all lowering remedies, and especially mercury, should be used with the utmost care and hesitation.

Thirdly. If no cause whatever can be detected; or if, when detected, it cannot be removed; or if, as frequently happens, even though removed, its removal fail to cure the disease, an *empirical* and *palliative* plan of treatment is the only resource. A course of *purgatives*, especially the croton oil, in doses of ♏ $\frac{1}{6}$ *ter die; tonics*, especially the carbonate of iron, and oxide or sulphate or valerianate of zinc; any remedies, in fact, that have been known to do good, may be tried in succession; taking care, however, not to impair the constitution by giving them at random. Opium, morphia, hyoscyamus, belladonna, conium, stramonium, or prussic acid, given internally; friction with ointments, or alcoholic solutions of veratria, strychnia, or aconitina, (ʒss ad ℥i)—galvanism, acupuncture, issues, and the moxa, generally afford some relief, and sometimes completely cure. *Division of the nerves*, with or without *excision* of a portion, is the last and a very bad resource. It may produce instant ease: this, however, lasts but a short time; and the oftener it is repeated the more transient are its effects. Sometimes, after repeated divisions, the pain is as severe as ever, although the part may become quite numb and insensible to the touch. The infra-orbital and mental nerves (which may be divided from within the mouth just as they escape from their foramina), the frontal, the radial, just after it has passed between the supinator tendon and the bone, and the digital, are those which have been most frequently operated upon.

VI. ANOMALOUS NERVOUS AFFECTIONS.—The same local and constitutional causes that gave rise to neuralgia, may also occasion every other symptom that can be produced by functional nervous disorder; such as rigid and permanent spasm (as in wry neck), or twitching and convulsion of muscles; difficulty of swallowing and performing evacuations, owing to spasms of the œsophagus, of the sphincter ani, or of the perineal muscles; sneezing, dumbness, stammering, thirst, and affections of the sight and hearing. The treatment must be conducted on the same principles.

CHAPTER X.

INJURIES OF THE HEAD.

SECTION I.—WOUNDS OF THE SCALP.

WOUNDS and contusions of the scalp, be they ever so slight, are not to be neglected. For they may be followed by erysipelas, or by inflammation and suppuration under the occipito-frontalis, or within the cranium, or by suppuration of the veins of the diploe, and general pyæmia, that may easily prove fatal. Wounds should be accurately and quickly closed; but first of all, care should be taken to wash away all foreign bodies and clots with *clean* water, and a bit of clean old linen, or a clean sponge. The writer will say, once for all, that sponges that have been used to wipe up foul discharges should *never* be used for recent wounds, particularly of the scalp. If used at all, they should first be thoroughly purified by immersion in weak hydrochloric acid. No part of the scalp, however torn or bruised, should be cut away. Cases are known in which almost the whole scalp has been stripped from the bone, and yet has been laid in its place, and the patient has perfectly recovered. It is wise not to use stitches if it can be avoided. Neither are they usually necessary; for the wounds may be controlled by plasters and bandages. If used, they need not go through the whole thickness of the scalp. It is a good plan to seal up the wound with *collodion*, or *Friars' Balsam* on lint; so as to coagulate the blood outwardly, and lessen the risk of suppuration. The patient should be confined to the bed, or to the house, and be purged, and put upon regular but not low diet.

Hæmorrhage from small vessels is usually controlled by closing the wound and using pressure. If a large vessel be wounded, it should be tied. Sometimes a blow on the head, which has not pierced the skin, causes an extensive and increasing extravasation of blood under the scalp, rendering it evident that an artery has been divided by the blow. The exact situation of the injured vessel should, if possible, be ascertained, and pressure be applied there with a small pad of lint and bandage.

If *suppuration* threaten, which will be indicated by sallowness, chills, and dry tongue, with some amount of swelling, and if purgation does not remove these symptoms, adhesions may be separated at any suspicious spot; or a moderate incision down to the bone be made at any part where mischief is likely to occur. Incisions are the *sine quâ non* in suppuration under the scalp.

If there is mere *serous effusion* in this situation, it may, if necessary, be let out by one or more punctures with a lancet. If blood is extravasated without a wound, absorption is to be promoted by moderate purgation and cold lotions; and no incision is to be made, unless positively necessary.

SECTION II.—CONCUSSION OR CONTUSION OF THE BRAIN.

Definition.—Concussion (commonly called stunning) signifies sudden interruption of the functions of the brain, caused by a blow, or other mechanical injury to the head.

Symptoms.—There are two degrees of it. 1. In ordinary cases, the patient lies for a time motionless, unconscious, and insensible; if roused and questioned, he answers hastily, and again relapses into insensibility; after a time he moves his limbs as if in uneasy sleep, and vomits, and frequently recovers his senses instantly afterwards; remaining, however, giddy, confused, and sleepy for some hours. 2. In the more severe degree the patient is profoundly insensible, the surface pale and cold, the features ghastly, the pulse feeble and intermittent, or perhaps insensible, and the breathing slow, or performed only by a feeble sigh, drawn at intervals.

Vomiting is an important symptom. It is not present in very slight cases, nor in very severe ones; and its occurrence is mostly an indication of approaching recovery.

Consequences.—1. In cases not attended with severe lesion, the patient suffers from some degree of headache and feverishness for a few days, which may be easily aggravated into a fatal inflammation of the brain. 2. If the concussion be very severe, it may be followed by death; and there is no doubt but that it is attended with more or less of contusion, ecchymosis, rupture, and extravasation of blood in small specks, or in larger masses; and that in the cases formerly described, in which persons were said to have died of concussion purely, without anatomical lesion, there was some injury of the spine or disease of the heart to account for death. And the word concussion really means contusion.* The degree of danger in any case may be estimated by the degree in which the spinal and ganglionic systems appear to be implicated. If, therefore, the pulse and respiration continue feeble for many hours; if the eyelids do not move when irritated, and the legs are not drawn up when the soles of the feet are tickled, the prognosis will be serious. 3. Concussion is occasionally succeeded by a peculiar state of insensibility, which may last some days. The patient lies as if in a tranquil sleep; his pulse is regular; but on the slightest exertion it rises to 130 or 140, and the carotids beat vehemently; when roused he answers questions, but immediately relapses into unconsciousness. Some patients in this state resemble somnambulists; they may get out of bed, bolt the door, shave, or make water, but still are insensible to what passes around. 4. It may leave a very infirm state of the health and intellect; impairment of the memory, or of the senses, especially of smell and hearing; and a constant tendency to inflammation, and to extravagant actions after drink or any other excitement.

Pathology.—The early symptoms, it be will seen, are partly those of impaired cerebral function, partly those of collapse, or syncope. Vide p. 1. It is commonly said that concussion may prove fatal without any injury that can be discovered by dissection; but Dr. Bright pointed out, many years ago, that the brain may be studded with minute ecchymoses, the size of pins' heads. The difference of injuries, however, inflicted slowly and gently, from those inflicted suddenly and with violence, is remarkable. As Mayo long ago observed, great part of the brain of an animal may be gently and quietly sliced away with little or no effect; but if ever so small a portion be suddenly crushed, the heart stops directly.†

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* See Mr. Prescott Hewett's Lectures, Med. Times and Gaz., 1858.

† "The English dragoon sword is so blunt, that the strongest man cannot drive it through the head-dress of the Sikh or Afghan; nevertheless the enemy is most often beaten from his horse, and frequently killed by the violence of the shock. Not so, however, with the trenchant blade of the Sikh: this weapon,

Treatment.—The *indications* are: 1, to recover the patient from insensibility and collapse; 2, to prevent inflammation; 3, to restore any faculties that may remain impaired.

1. In order to fulfil the first indication, friction of the surface with the hand, and the application of warmth to the feet, may be resorted to, if the depression is very great, and the pulse very low; but it is better in most cases to leave the patient to recover by himself, than to be officious in administering stimulants, as they would increase the effusion of blood, supposing the brain to be lacerated. Mr. Guthrie's sentiments on this point are very decisive. "It is useless to open the patient's veins," he observes, "for they cannot bleed until he begins to recover, and then the loss of blood would probably kill him. It is as improper to put strong drinks into his mouth, for he cannot swallow; and if he should be so far recovered as to make the attempt, they might probably enter the larynx and destroy him. If he be made to inhale strong stimulating salts, they will probably give rise to inflammation of the inside of his nose and throat, to his subsequent great distress."*

Professor Miller has well observed, that during the insensibility from shocks the patient should be examined to ascertain what other injuries, if any, he has sustained. Broken bones, dislocations, and wounds should then be set to rights.

2. After reaction has taken place, the bowels should be freely acted on, and perfect rest and low diet should be observed. If the pulse becomes hard and frequent, and if the patient complains of pain or tightness in the head, or becomes flushed, or delirious, or stupid and comatose, if vomiting come on again, or heat of head and white tongue, blood should be taken from the arm, or by leeches or cupping from the head, the purgatives should be repeated as often as may be necessary, with saline and antimonial draughts in the intervals; and the head should be shaved and kept wet with evaporating lotions. As a general rule, after any severe blow on the head, the patient should observe a cautious antiphlogistic regimen for a month or six weeks—carefully keeping himself free from all fatigue, intemperance, and excitement. If violent delirium or convulsions come on after an injury to the head which has been treated by copious venæsection, and if they are not relieved by further depletion, or if that seems inexpedient, they would probably yield to acetate of morphia.

3. In order to remove headache, deafness, giddiness, squinting, loss of memory, tinnitus aurium, and other remote consequences of con-

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wielded by a strong man, will cut through any head-piece, and bury itself perhaps in the brain; and yet you find no symptoms of concussion or compression. In the former example the soldier is effectually disabled, often killed outright; in the latter, although the individual is mortally wounded, he may be able to continue the fight, and even to kill his antagonist, before he falls himself dead or dying from his horse."—Cole's Field Practice in India, p. 45. See also a very able paper in the B. and F. Quarterly, Jan. 1853, by Dr. R. C. Williams.

* Guthrie, G. J., on Injuries of the Head affecting the Brain, Lond. 1842, p. 11.

cussion, a course of mild alterative mercurials, repeated blisters, or an issue or seton, the shower-bath, change of air, and a most regular diet, are the remedies.

SECTION III.—COMPRESSION FROM EXTRAVASATED BLOOD.

Symptoms.—The symptoms of compression of the brain are those of apoplexy. They are, insensibility; palsy (sometimes general, sometimes confined to one side); dilated and insensible pupil; slow, labouring pulse; skin often hot and perspiring; retention of the urine, through palsy of the bladder; involuntary discharge of fæces through palsy of the *sphincter ani;* and stertorous breathing, owing to palsy of the *velum pendulum palati.* Sometimes, however, the pupils are contracted, and sometimes one is contracted and the other dilated.

That side of the body is paralysed which is opposite to the injury; and the paralysis, like the insensibility, may vary immensely in degree. There may be every degree from mere numbness and weakness to complete loss of power; and every degree of interruption to the mental functions, from slight drowsiness, or slowness, to utter unconsciousness. Convulsions and muscular twitchings or rigidity indicate generally irritation or laceration of the brain or its membranes.

Causes.—Compression (surgically considered) may be produced by three causes. 1. By extravasation of blood. 2. By fracture of the skull, with depression. 3. By suppuration within its cavity.

The *symptoms of compression from extravasated blood* generally show themselves in the following manner:—The patient receives a blow, and becomes stunned and insensible from the concussion, with extremely feeble pulse and cold skin. After a while he recovers his senses; but again in an hour or two he becomes sleepy, confused, and insensible; with slow stertorous breathing, slow pulse, and dilated pupils. The symptoms closely correspond with those of one form of apoplexy, called the *ingravescent*; in which the patient suddenly feels an acute pain in the head, caused by the bursting of a blood-vessel, and becomes sick and faint—in fact, suffers from concussion. Then he recovers his senses; but shortly afterwards, as the extravasation from the ruptured vessel increases, becomes quite comatose.*

On the other hand, if a large quantity of blood is extravasated rapidly, the symptoms of compression may immediately succeed the insensibility of concussion, without any interval of consciousness.

The blood may be situated, 1, between the dura-mater and skull; and if in large quantity, it proceeds most likely from laceration of a branch of the middle meningeal artery. It may, however, proceed from one of the sinuses, particularly the lateral. It is the common consequence of fracture, by which the vessels running in the grooves of the bone are torn through. 2, between the membranes. Here we may refer to p. 23, for a notice of the fact, first clearly pointed out by

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* Copland, Dict., *Art.* Apoplexy.

Mr. Prescott Hewett, that injuries are often accompanied with extravasation within the cavity of the arachnoid; and that the blood may coagulate, forming a thin layer, which adheres and becomes vascular like a false membrane. 3, in the substance of the brain.

The *diagnosis* between the symptoms of concussion and those of compression is a sort of *pons asinorum* and bugbear to young students, who are often led to expect sharply-drawn distinctions which are seldom found in practice. Moreover, it is often confused by ideas that the injury in concussion is *immaterial;* whereas, as we have before said, the real condition of a concussed brain is one of contusion and ecchymosis, which may produce symptoms of their own. The leading points of distinction are obvious enough.

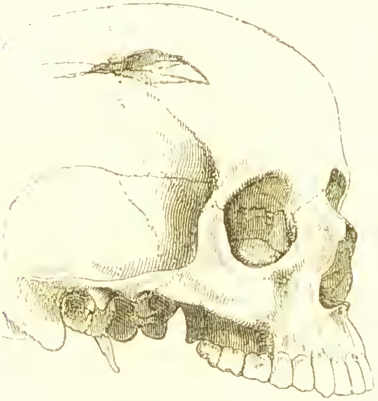
1st. The symptoms of concussion always follow the accident immediately; those of compression from effusion of blood *may* come on after an interval. "The first stunning or deprivation of sense," says Pott, "may be from either; no man can tell from which; but when these first symptoms have been removed, or have spontaneously disappeared, if such patient is again oppressed with drowsiness or stupidity, it then becomes most probable that the first complaints were from concussion, and that the latter are from extravasation." 2ndly. In concussion the pulse is feeble, and the skin pale; and the greater the insensibility the feebler will the pulse be. In compression, on the contrary, when reaction is thoroughly established, the pulse will be slow and full, and the skin hot and perspiring. 3rdly. Stertorous breathing and muscular palsy are rare in mere concussion, common in compression. 4thly. The pupil in concussion is variable: sometimes contracted, sometimes dilated, and not always insensible to light; in compression, it is almost always dilated and insensible.

Treatment.—The head should be shaved and examined, and if there is *no sign* of fracture or injury, the case must be treated as one of apoplexy; the *indications* being to avert inflammation, and procure absorption of the blood by cold applications to the head, a large dose of calomel, and purgatives in repeated doses. If, in spite of the above measures, the insensibility continues, and the lungs become clogged with mucus, and the breath escapes from the corner of the mouth with a peculiar whiff during expiration, which are very perilous symptoms, the last resource—and under these circumstances, it must be confessed, a very desperate one, and one which modern surgeons become daily more unwilling to resort to,—is trephining. The trephine should be rather large, because the blood is almost always found coagulated. Perhaps the inner table may be found extensively fractured, with only a mere fissure of the outer table. An exploratory incision may be first of all made at the seat of injury; or, if that be unknown, over the parietal bone on the side, *opposite to the paralysis*, if any.

When a piece of bone has been removed, the dura-mater, in its normal state is found to be level, and of a reddish-silvery colour, and it rises and falls synchronously with the motions of respiration; but if there is fluid underneath, it bulges up tightly into the aperture made by the trephine, and its motions are very indistinct or entirely lost. In this latter case a puncture should be made to let the fluid escape; and numerous instances are on record in which, after the surgeon has punctured the distended dura-mater, and some ounces of blood have escaped, the patient has recovered his consciousness immediately.*

Lastly, to quote from the valuable practical remarks of Mr. P. Hewett, supposing a man to fall—from a ladder, for instance—in a fit of apoplexy, care must be taken not to ascribe to the fall the effects of the disease which preceded it.

SECTION IV.—FRACTURE OF THE SKULL.



FRACTURES of the skull are caused by great violence, such as blows or falls on the head, and gun-shot wounds. If the blow be caused by a large blunt object, or by a fall on the head, it will most likely result in a widely extended fissure, running perhaps across the vault or base of the skull, and tearing arteries, sinuses, or nerves in its way; fracture of the base, for example, is common when the patient falls on his head from a height, so that the weight of the whole body tells upon the base of the skull through the spinal column.

If the blow be caused by a sharp instrument, as a hammer, or pickaxe, or brickbat, it will probably cause a *starred* depression confined to the seat of injury.

The SYMPTOMS and consequences of fracture of the skull depend on the conditions which accompany it; especially, 1. On the amount of concussion or of internal hæmorrhage. 2. On the forcing in of portions of bone so as to compress the brain. 3. On the complication with scalp wound. 4. On the situation. 5. On the inflammation excited subsequently.

1. SIMPLE FRACTURE WITH DEPRESSION may be ascertained by a careful examination of the shaved scalp, when, if it exist, there will be felt a depression at one part, with a corresponding edge or projecting ridge near it. Sometimes a coagulum of blood under the scalp conveys the feeling of a sharp elevated ridge of bone: it may be known, however, by its yielding to firm pressure with the finger, and by observing that no part of the bone is *below* its natural level. Sometimes, too, an

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* Guthrie, op. cit., pp. 39, 125; Brodie, Med. Chir. Trans., vol. xiv.

irregular conformation of the sutures and Wormian bones may be mistaken for fracture.

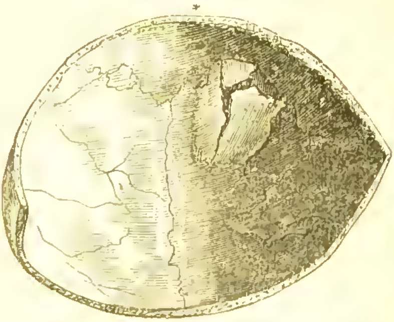
Moreover, a mere driving in of the outer wall of the *frontal sinuses* is not necessarily attended with injury to the brain.

Treatment.—In a case of *simple* depressed fracture; if there are no symptoms of compression, and if the patient is conscious and rational, he should be bled, purged, and kept under the strictest antiphlogistic regimen; and then, perhaps, recovery may be completed without the slightest appearance of compression, and inflammation be averted. Even if there be *slight* symptoms of compression, the same plan is to be adopted.

In children, whose bones are soft and thin, great indentations and depressions may be produced without fracture. They are to be treated antiphlogistically; and if the bowels are kept well open, they may not cause any bad symptom whatever, and the bone may rise in time to its proper level.

2. If the fracture be *compound*, in like manner it is better not to trephine, unless there are urgent symptoms. If *comminuted*, and if splinters are sticking into the brain or its membranes the bone must be elevated. If possible, it should be done with the elevator alone. But if one piece of bone is wedged in under another, a *small* aperture should be made with the trephine, or Hey's saw, in order to make room for employing the elevator. If any pieces of bone are perfectly loose and detached, they must be removed; but not if they have a pretty good adhesion to the pericranium or dura-mater.

3. FRACTURE OF THE INNER TABLE.—This part may be splintered extensively by some injuries which do no great damage to the outer table; especially by sabre-cuts descending perpendicularly; musket-shots, and blows with pokers and similar weapons. When there is reason to suspect this, a most careful examination should be made with the probe, and, if discovered, the trephine should be employed to raise or remove any splinters that may compress or irritate the surface of the brain.



4. FRACTURE OF THE BASE OF THE SKULL may run in various directions, but most frequently through the petrous, squamous, basi-sphenoid, and ali-sphenoid bones. The diagnosis will be founded—1. On the nature of the injury; for the patient has probably pitched on his head, and has a wound or bruise on the vertex, but no fracture

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[*] Fracture of the Inner Table of the Skull, St. Mary's Museum.

there. 2. There will most probably be copious venous bleeding from one ear: the blood coming from the diploe of the bone, being permitted to well out through the tympanum by laceration of the membrana tympani. In this case, if the mouth and nostrils be closed, air will perhaps also bubble out through the external auditory meatus in expiration. 3. After bleeding has ceased, a most significant symptom is the draining away through the ear of the cerebro-spinal fluid from beneath the arachnoid. It is a clear fluid, hardly coagulable by heat. and containing much less albumen and saline matter than serum does. This indicates that the fracture passes through the internal auditory meatus, and has ruptured the tube of arachnoid, which accompanies the auditory and facial nerves into that meatus, and so allows the escape of the cerebro-spinal fluid. Immense quantities of it may be discharged. 4. Various symptoms may be noticed, indicating damage to the nerves that escape by the base of the skull. Thus extreme deafness points to the auditory; paralysis of the muscles of the face, inability to close the eye tightly, and a dragging of the mouth to the opposite side, point to the facial nerve; loss of sensibility in either half of the tongue, to the third division of the fifth; loss of motion, to the ninth; inability of swallowing, and slow or stertorous breathing, to the eighth; and thus the implication of these nerves shows the course of the fracture to be through their several foramina. 5. Bleeding from the nose or mouth, and great ecchymosis within the orbit, not a mere speck of blood beneath the conjunctiva, but a complete ecchymosis coming from behind, will also show the direction of fracture. In some cases traumatic aneurysm of the orbit has followed, and has been relieved by ligature of the common carotid.

In this and in other fractures of the skull the symptoms depend on the amount of injury to the brain, and so does the *prognosis*. Stupor, dilated pupils, with rapid pulse, hot skin, dry tongue, and delirium, are unfavourable symptoms; yet fracture of the base has been shown not to be so necessarily fatal as was once supposed; and if there is no primary injury to the brain, if the patient is thoroughly purged and kept on low diet and in the most absolute repose, so as to arrest inflammation, he may recover.*

SECTION V.—WOUNDS OF THE BRAIN, AND HERNIA CEREBRI.

I. WOUNDS OF THE DURA-MATER add very considerably to the danger of compound fractures of the skull, both from the risk that inflammation may spread over the surface of the arachnoid, and from the greater chance of hernia cerebri. Hence this membrane should never be punctured in search of fluid, without due consideration.

II. WOUNDS OF THE SINUSES are of no great consequence, provided the blood does not accumulate within the skull; hæmorrhage from them is easily restrained by pressure.

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* See Guthrie, op. cit.; Sharp on Injuries of the Head, Lond. 1841; MM. Laugier, Robert, and Chassaignac, in Ranking's Abstract, vols. ii. and iii.; Mr. Hilton's excellent Clinical Lectures, Lancet, 1853, vol. i.; and Prescott Hewett's Lectures, Med. Times, 1855 and 1858.

III. WOUNDS OF THE BRAIN, whether incised or lacerated, are not attended with special and recognisable symptoms besides those which arise from the concussion, compression, or inflammation that may accidentally be present. Instances are numerous in which portions of the brain have been lost, without any ill consequences at the time or afterwards. But yet Sir B. Brodie has observed in some cases a greater degree of mental confusion than usually attends concussion, and, in others, spasmodic twitchings of the muscles.

If *foreign bodies* are embedded in the brain, the danger will be materially augmented. Sir B. Brodie says, that no foreign body, whether a portion of the skull or not, is to be removed, if the removal will add in the least to the irritation or injury; but the practice of most surgeons is to remove them without delay, but with as little disturbance as possible.

The *treatment* of these cases consists in the preventing of inflammation, and in causing the wound to cicatrize without the formation of *hernia cerebri.*

IV. HERNIA CEREBRI.—When a portion of the skull has been removed, the brain is liable to protrude through the aperture in the form of a rounded tumour, styled *hernia* or *fungus cerebri.* Mr. Guthrie describes two varieties of it. In the first, which occurs within two days, the tumour is composed of coagulated blood, and is caused by hæmorrhage into the brain near its surface. It is accompanied with delirium and phrenitis, and is generally fatal. The best treatment is, to shave it off level with the surface, so as to permit a free discharge of blood. The other kind of tumour consists of brain itself, infiltrated with lymph. If the dura-mater is still entire, the tumour causes it to slough by its constant pressure, and then protrudes through the aperture in the skull. As it increases in size, it suffers constriction from the aperture through which it passes, and sloughs; but is speedily succeeded by a fresh growth of brain and of fungous granulation, which undergoes the same processes, till the patient dies of the irritation.

Treatment.—In order to prevent this tumour, a well-regulated pressure, just sufficient to afford a natural support, should be made upon the brain by means of compresses of soft lint oiled, in all cases when the skull is perforated. If the fungus has already protruded, the best application is liq. calcis, with which the lint may be wetted. If this fail, and the degree of pressure requisite to prevent increase cause symptoms of cerebral oppression, the part should be shaved off level with the scalp, and any further growth be prevented by the liq. calcis and lint, and pressure, as before.

SECTION VI.—TRAUMATIC INFLAMMATION OF THE BRAIN.

GENERAL DESCRIPTION.—Inflammation of the brain and its membranes rarely makes its appearance till a week after an injury, frequently not till three weeks, or even later. Its symptoms and progress are very various; sometimes sudden, violent, and soon terminating in destructive suppuration; sometimes slow, insidious, and unsuspected, till suddenly manifested by fatal coma or palsy.

SYMPTOMS.—*First stage.*—The patient complains of tightness and pain in the head, aggravated by heat, motion, and anything that causes excitement of mind or body, together with a disagreeable sense of languor or weakness, confusion of ideas, quick pulse, disturbed sleep, nausea, and want of appetite, and alternate flushing and paleness. *Second stage.*—The symptoms having lasted a day or two, there comes on a violent rigour, followed by burning heat of the skin: the pulse is hard and frequent; the carotid and temporal arteries pulsate vehemently; the headache becomes most intolerable and throbbing, the pupils are contracted; light is unsupportable to the eyes, and sound to the ears; the tongue is dry, the bowels obstinately costive, and the stomach rejects everything with frequent retching. Besides these symptoms, violent delirium or convulsions come on at intervals, or perhaps coma. If they are unrelieved, the *third stage* soon follows. The pulse loses its force, and becomes either slow and oppressed, or excessively rapid; and squinting, low delirium, convulsions, or palsy, soon usher in death. Rigours, followed by squinting, dilated pupil, stertorous breathing, coma, and palsy, are indications of suppuration.

Certain changes on the outside of the head also accompany the mischief that is going on within. Supposing the injury which is the cause of the inflammation to have been accompanied with a wound, which up to the occurrence of the inflammation has been going on well,—to use the words of Pott, "the sore loses its florid complexion and granulated surface, and becomes pale, flabby, glassy, and painful; instead of good matter, a thin gleet is discharged from it; the lint with which it is dressed sticks to all parts of it; and the pericranium, instead of adhering firmly to the bone, separates all round from it to some distance from its edges." The bone, moreover, may become white, dry, and bloodless. If there be no wound, the scalp will present a puffy, circumscribed, indolent tumour at the seat of injury, on incising which the pericranium is found detached. If the dura-mater is exposed, it at first appears of "a dull, sloughy cast, and smeared over with something glutinous," and subsequently is covered with matter.

PATHOLOGY.—So far we have described the classical or heroic form of acute encephalitis. But many cases will be met with in which the order of symptoms is very irregular. Thus, in the first place, severe and continuous vomiting may be the earliest symptom, without any complaint of the head; or a sudden attack of convulsions, or of furious delirium; or a sudden palsy, owing probably to insidious mischief which betrays itself when too late; or pains in the head of an intermitting character; or severe shiverings, terminating in a hot and sweating fit;—and many of these symptoms may occur without any fixed or regular signs of inflammation being betrayed by the pulse. Again, injuries of the skull are liable to be followed by *pyæmia*, with abscess in the lungs, liver, or joints, and the other signs of that affection. This may occur from mere bruises which have injured the diploe, without fracture of either table, and without wound. Sleeplessness, wild intermitting delirium, and sudden suppression of a flux of cerebro-spinal fluid from the ear, after fracture of the base of the skull, especially if accompanied by hot skin, quick pulse, and rigours, are very suspicious symptoms.

MORBID ANATOMY.—The morbid appearances usually found are suppuration in the diploe; clots in the sinuses; exudation of yellowish or greenish lymph on the free surfaces of the dura-mater and arachnoid, covering perhaps extensive tracts, and perhaps partially or entirely converted into pus; similar exudation beneath the arachnoid; serous effusion into the ventricles; softening, or abscess of the central part of the brain or cerebellum.

PROGNOSIS will be unfavourable if the malady is not promptly relieved by depletion, or if it has advanced to its second stage.

TREATMENT.—The prevention of inflammation after injury depends chiefly on the most perfect quiet of mind and body, which may be insured by Dover's powder or opium; by free purging; a moderately low diet; and the application of cold to the head. The earliest symptoms are to be combated by free bleeding and leeching, with cold to the shaved head, and purgatives with antimony. If exudation seems to be pouring out, as indicated by the persistence of the symptoms, in spite of depletion, the remedies are mercury given so as to affect the system—for instance, two grains of calomel every six hours; blisters to the head or nape of the neck; mustard cataplasms to the feet; terebinthinate or stimulant enemata; and trephining, if suppuration is indicated by symptoms of compression (and especially by palsy of the opposite side of the body), or by the above-mentioned state of the wound. The trephine should be large, and if the matter be seated between the dura-mater and skull, it may afford relief. But so capricious are the symptoms of injury and disease of the brain, so difficult the diagnosis, so impossible is it to be always sure of the precise seat of mischief, and so inherently dangerous are these injuries necessarily, that the trephine may not lay bare the real mischief, or even, if it does, may give no relief.

Abscess in the brain, or *softening*, may be very remote consequences of injury, not occurring perhaps for years. Their *symptoms* are very obscure and insidious. Occasional headache; general loss of health and strength; impairment of the memory or other mental faculties; quick pulse, and furred tongue; disorder of the eyes or ears; sense of constriction, or of coldness in the scalp, or of creeping in the limbs, with numbness, are the most frequent. But these are succeeded by sudden convulsions, or palsy, or coma, from which the patient soon dies, although he may perhaps recover for a time.

Treatment.—Blisters, issues, or setons; mercurial alteratives; purgatives; shower-baths; the most regular diet, and avoidance of every kind of excitement of mind or body, are the remedies in case mischief is expected. After the occurrence of palsy, or other decided symptoms, blisters; leeches, if the pulse is strong enough, and there is pain or heat in the head; purgatives and enemata. But if the patient is low and feeble, he must be supported by mild nutriment and stimulants, especially ammonia.

SECTION VII.—TREPHINING AND PARACENTESIS.

1. Trephining.—The apparatus requisite for this operation comprises a large and small trephine, a straight and curved Hey's saw, and an elevator—besides a good scalpel, and the other instruments which every surgeon is supposed to have in his pocket.

There are four cases which may require this operation. 1. Fracture of the skull with depression of bone. 2. Extravasation of blood under the skull. 3. Suppuration of the dura-mater. And, lastly, occasional cases of epilepsy arising from the irritation of a diseased spot of the skull. For the first and last cases, the trephine should be quite small, so as not to sacrifice more bone than is absolutely necessary.

Supposing it to be a case of depressed fracture. In the first place, the bone, if not already laid bare by a scalp wound, must be exposed by an incision in the shape of a V, or H, or T. Then, perhaps, some loose fragment may be picked out, or a projecting point may be cut off with a Hey's saw, or with bone forceps, that will enable the surgeon to raise the depressed portion. But if this cannot be done, a circular piece, consisting of the edge of the depressed bone, and of the adjoining bone under which it has been wedged, must be removed. The pericranium being shaved off from the part which is to be perforated, the surgeon applies the trephine, and works it with an alternate pronation and supination of the wrist, and when it has made a circular groove deep enough to work in steadily, he takes care to withdraw the centre pin. He saws on steadily and cautiously, pausing frequently and examining the groove with a probe, to ascertain whether it has reached the dura-mater, and when it has, he introduces the elevator to raise the circular piece of bone. He must be particularly careful to fix the centre pin, and the greater part of the circumference of the instrument, on firm bone,—and by no means to press heavily, whilst sawing, on any piece that is loose or yielding. The saw will be known to have reached the diploe by the escape of blood with the bone-dust; but it must be recollected that the diploe exists neither in children nor in the aged. When the piece of bone is removed, the surgeon must gently insinuate the point of the elevator under that which is driven in, and using his finger, or the edge of the firm bone as a fulcrum, must carefully raise it to its proper level. Then all loose fragments having been removed, and the wound sponged clean, the scalp must be carefully laid down, and the patient be put to bed. The trephine should not be applied in the course of the sutures, nor over the lower part of the frontal or occipital bones, if it can be avoided; but, if necessary, there is no great objection.

II. Paracentesis Capitis, or puncture of the head, is an operation that has been resorted to in hopeless cases of hydrocephalus in children. It consists in introducing a very fine trocar or grooved needle perpendicularly to the surface, through the anterior fontanel, as far as possible from the longitudinal sinus. When two or three ounces of fluid have escaped, the puncture should be carefully closed, and moderate support be applied to the head by bandages. If the child becomes faint, it must be kept in the recumbent posture, and have a few drops of sal volatile. The operation may be repeated at intervals of two or three weeks.*

SECTION VIII.—TUMOURS.

I. Tumours of the Scalp are most frequently cutaneous cysts, see pp. 103, 203, 226; or vascular tumours.

II. Tumours of the Bones are apt to be of most ivory-like density. If near the orbit, so as to interfere with the eye, or if very disfiguring, they may be removed.

III. Tumours within the Cranium, that concern the surgeon, are usually fibro-plastic, or soft cancer, arising in the bone or membrane, and perforating the skull. Other enlargements, such as aneurysms, or hydatids, will produce similar symptoms at first. The earliest symptom is generally intense, long-continued, and frequently returning headache. Then there may follow the signs of compression, in the form of gradually-increasing mental imbecility, and palsy of the limbs. Sometimes the patient is cut off with a sudden attack of hemiplegia. But if he survives long enough, the growth makes its way outwardly, perforates the skull, and appears as a soft lobular tumour. Attentive examination may perhaps detect two kinds of pulsation in it; one synchronous with the arterial pulse, the other with the rise and fall of the brain in respiration. The tumour cannot be moved laterally; but in its earlier stages may perhaps be returned into the skull, giving rise, when returned, to symptoms of compression of the brain which subside when it is permitted to protrude again.—See p. 99.

The *treatment* must be palliative; leechings, purgatives, and moderate diet. Any interference with the knife is almost sure to be fatal.†

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* See Dr. Watson's Lectures in the Med. Gaz. for March 1841.

† See Lebert, sur les Mal. Cancéreuses, &c.

CHAPTER XI.

DISEASES AND INJURIES OF THE SPINE.

SECTION I.—DISEASES AND DEFORMITIES.

I. Lateral Curvature from debility of the bones, ligaments, and muscles, is exceedingly common in this country in young females from about the age of ten to sixteen. The first thing that attracts attention is a projection, or, as the vulgar say, *a growing out* of one scapula, or of one side of the bosom, or an elevation of one shoulder, most commonly the right. On examination, the spine is found to be curved like an italic *f*, and somewhat twisted on its long axis. The right shoulder and the right side of the chest are unnaturally high and rounded, whilst the opposite is depressed and concave. In the same way the left hip projects, whilst the loins on the right side are curved inwards.

Causes.—This affection is readily caused by occupations or postures that tax one side of the body more than the other; especially the habit of *standing at ease* on the right leg, with the left knee a little bent; a common habit with all persons who stand long. By this means the left side of the pelvis is thrown up, and the right shoulder raised. Awkward one-sided postures in sitting whilst writing, or at needle-work, are also causes. We may add, that there are some circumstances which may possibly cause distortion, even in the healthiest adult; such as one leg being shorter than the other, or walking with a wooden leg. Why one-sided postures should cause distortion must be evident, when it is considered that the intervertebral substance is compressible, to such an extent, that an adult man of middle stature loses about an inch of his height after having been in the erect posture during the day, and does not regain it till after some hours of rest. "Since the united thickness of the intervertebral substance in an adult man is about 3·875 inches," we see that they lose nearly one-fourth by compression, which they do not recover till after some hours of rest. But if the weight of the body falls unequally on the spine day after day, it must be evident that they will become compressed on one side more than on the other; and that if their elasticity be impaired, and the muscles and ligaments be weak, and the bones soft, as they are in young persons who have not a sufficiency of fresh air, wholesome food, and active exercise, this lateral distortion will become permanent.*

Curvature from Rickets.—There is another form of curvature from debility, which chiefly affects young children of the lower orders, and arises from *rickets*. It is readily distinguished by the general rickety aspect of the patient (vide p. 217), and by the distortion of the limbs that is also present, as well as by the circumstance that the spine is not simply curved laterally, as described above, but is often curved directly forwards; the seat of this curvature being the upper part of the back; or perhaps it may be curved backwards.

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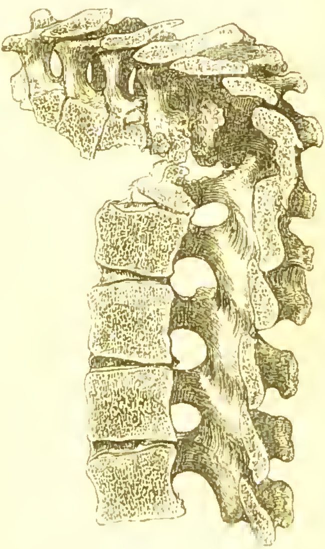
* Bishop, Lancet, 1846, vol. i., p. 215.

Treatment.—The first and most essential measure is to strengthen the bones and muscles, by means of good diet, sea air, steel, cod-liver oil, or phosphate of lime, F. 201; the shower-bath; sluicing the back with cold salt and water in the morning; a hard mattress instead of a soft feather-bed; early rising, and abstinence from books. 2. Whilst the back is weak, it ought never to be subjected to the dead-weight of the body.[*] The patient should take as much out-door, foot, or horse exercise as her strength will allow; but when not moving, she ought to be lying down on the floor, or on any convenient hard couch, and not sitting or standing upright. 3. A gentle course of gymnastic exercises, calculated to bring the left arm into play, may be useful. 4. Mechanical support may be required in severe cases; and the best way of applying it seems to be by a circular well-padded iron girdle, to be buckled round the pelvis, to which is attached a crutch, by which the axilla of the depressed side can be supported and gradually raised, whilst a broad band passes over the convex side of the chest, and forces it back into its proper position. The author has devised a chair, with supports for the shoulders, so that they can be kept at the same level, and in the same vertical plane; whilst it allows of free motion of the body backwards and forwards.[‡]



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II. ANGULAR CURVATURE (*Pott's Curvature*) is produced by softening and absorption, or caries of the bodies of the vertebræ—a disease which generally affects scrofulous children or adults. It usually begins with symptoms that indicate irritation of the spinal cord, such as weakness, coldness, and numbness of the legs, and incapability of taking exertion; and these symptoms are followed by twitchings and spasms of the legs, and afterwards by palsy. The bowels are costive; and there is difficulty sometimes of passing, sometimes of retaining, the urine, which is generally pale and alkalescent. Children rarely complain of much pain or tenderness in the back; but if the patient is an adult, there is generally a heavy dull aching pain, aggravated by motion, together with great tenderness on pressure; and a peculiar dead sickening sensation like that of a carious tooth, if a smart blow be struck on the diseased part with the knuckles. Great distress is sometimes caused if the patient seats himself quickly (or bumps down into a chair, as the vulgar say), so as to shake the spinal column; and this will sometimes elicit a complaint from children, who give no other sign of pain or tenderness. If the disease is situated in the dorsal vertebræ, it will moreover be accompanied with tightness of the chest, and difficulty of breathing; and if in the cervical, one or both arms may be palsied, and there will be a difficulty of supporting the head, which the patient steadies with his hands whenever he moves about. As the disease advances, the trunk becomes curved forwards, and the spinous processes of the diseased vertebræ project backwards; so as to cause great deformity. Perhaps abscesses, of the chronic scrofulous sort, form, and if so the patient will exhibit great constitutional derangement and hectic.

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[*] Jackson, the pugilist, used to say that he knew an infallible plan for making any child crooked; viz., Let it bolt its victuals and stand on one leg. Mayo's Philosophy of Living.

[†] From a preparation of Mr. Fergusson's, in the King's College Museum.

[‡] It is made by Spratt, of Brook-street, Hanover-square.

Consequences.—1. In favourable cases, the diseased bones collapse and are anchylosed, as after ulceration of the cartilages of joints; abscesses, if they form, are healed, or their matter is absorbed; and the patient recovers in two or three years, with more or less deformity, which is of course incurable. 2. In some fatal cases the patient dies suddenly from two or three of the diseased vertebræ giving way, and crushing the spinal cord; or from dislocation of the odontoid process, owing to ulceration of its ligament; or from the bursting of abscesses into the spinal cord; or from their bursting into the pleura or peritoneum; but more frequently death is caused by slow irritation and exhaustion, consequent on the formation and bursting of psoas or lumbar abscesses.

Diagnosis.—This affection must not be confounded with hysteria. It may readily be distinguished from the distortion which arises from debility by noticing that the curvature is abrupt and angular, whereas in the latter affection it is gradual and rounded, and implicates nearly the whole spine.

Treatment.—1. *Rest* in the horizontal posture is absolutely necessary. But the patient must not be taught to lie on his back, nor must any means be used with a view of straightening the spine, as they would merely impede the natural process of recovery, by preventing the remains of the diseased vertebræ from falling together. A bandage containing strips of whalebone, and reaching from the head to the hips, is of use in keeping the trunk at perfect rest. 2. *Issues* may be made and kept open with caustic on each side of the spinous processes of the diseased vertebræ, if there is any irritation of the spinal cord. In scrofulous cases they do no good. *Leeches* may relieve occasional accessions of pain or tenderness. 3. At the same time, the constitution must be thoroughly supported by good diet, and by cod-liver oil, sarsaparilla, phosphate of lime, F. 201, or bark with lime-water, and steel, and other tonics and alteratives, as directed for scrofula. 4. Efficient mechanical support during convalescence is necessary.

III. LUMBAR AND PSOAS ABSCESS.—These are abscesses arising commonly from that diseased condition of the spine which has just been described, although abscesses may occur in the same situation from constitutional debility and other causes, without spinal disease. When the connexions of the various muscles and fasciæ to the spine are considered, the variety of courses which these abscesses take is very intelligible. Sometimes they *point* in the back (constituting *lumbar abscess* if low down); sometimes the matter makes its way between the abdominal muscles, and may *point* at any part of the abdominal parietes; sometimes it enters the sheath of the psoas muscle, passes downwards in its sheath, causes absorption of that muscle, and points below Poupart's ligament, forming a tumour which diminishes or disappears when the patient lies down, and receives an impulse on coughing. This is called *psoas abscess.* In some few cases it does not extend below Poupart's ligament, but can be felt through the abdominal parietes as an oblong tumour in the situation of the psoas muscle: in other cases it extends downwards into the thigh, on either side, or in front of the femoral vessels. Sometimes it reaches so low as the knee; sometimes passes backwards to the nates; sometimes through the pelvis and sacro-sciatic notch to the nates; and sometimes it has discharged itself through the bladder or rectum.* In all cases of doubtful diagnosis the evidence of disease of the vertebræ, and of rigidity of the psoas muscle, or of inability to hop on the leg of the diseased side, or to extend it fairly on the pelvis should be looked for. The diagnosis is further alluded to in the Chapters on Aneurism and Hernia.

Treatment.—The first indications are, to procure absorption of the matter, to keep up the health, and to remedy the spinal disease. If the tumour enlarges, and threatens to burst in spite of these measures, it must be treated in the manner directed for *large chronic abscess.*

IV. ACUTE OR SUBACUTE INFLAMMATION of the spinal cord may be caused by blows, by twists, or other injuries, and may occur during acute rheumatism; moreover, it not unfrequently attacks persons who are greatly exposed to cold and wet, such as labourers and prostitutes. It is not uncommon in hot climates in the form of peculiar diseases, called *barbiers* and *beriberi.* Fever, violent pain in the back, and complete paraplegia, with loss of power over the rectum and bladder, are the symptoms. The treatment must consist of bleeding or cupping; calomel to affect the mouth, and subsequently blisters and warm baths. In subacute and chronic cases the iodide of potassium; with colchicum or alkalis if indicated by the state of the urine; or the bichloride of mercury with tincture of bark, F. 87.

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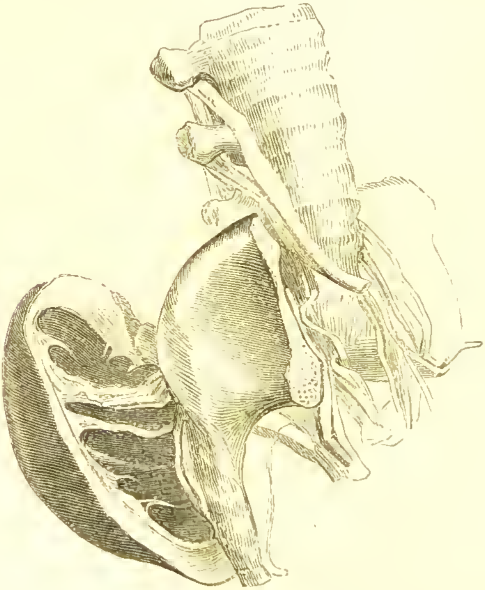
* See Stanley, op. cit., p. 331. Mr. Stanley points out the diagnosis between the *psoas* abscess and the *iliac* abscess; which latter is a collection of matter in the cellular tissue between the peritonæum and the fascia iliaca, or between that fascia and the iliacus muscle. It generally arises from cold, strains, or falls, or from general debility; sometimes from spinal disease, but it is not so regularly connected with the last cause as psoas abscess is. It generally attacks adults, and often women after parturition. It usually points *above* Poupart's ligament, near the anterior superior spine of the ilium; and the difficulty of extending the thigh, so constant in psoas abscess, is absent.

V. Spina Bifida, or *hydrorachitis*, is an affection in which the spinous processes and laminæ of some of the vertebræ are cleft or deficient. The spinal membranes, deprived of their ordinary support, yield to the pressure of the fluid which they contain (which also is secreted in unusual quantity), and bulge out, forming a fluctuating tumour in the middle line of the back.

Pathology.—This affection evidently has its origin in the earliest stage of fœtal existence, and depends on an arrest of development of the neural arches of the vertebræ, and generally of the lumbar and sacral. It is found, on dissection, that not merely the spinal membranes are distended, but that the nerves or the cord itself may have very important connexions with the sac. "If the tumour," to use Mr. Prescott Hewett's words, "corresponds to the two or three upper lumbar vertebræ *only*, the cord itself rarely deviates from its course, and the posterior spinal nerves are generally the only branches which have any connexion with the sac. But if the tumour occupies partly the lumbar and partly the sacral region, then generally *the cord itself* and its nerves



will be found intimately connected with the sac. M. Cruveilhier believes from his dissections that this connexion is constant."

This is well illustrated by the sketch in the preceding page of a preparation in the St. George's Hospital Museum, made by Mr. Hewett, who kindly obtained permission for the author to have the drawing made. The patient was five months old, and died under Mr. Tatum's care. The cavity of the tumour is seen to be intersected by the cord, and by the nerves emanating from it. The cord and its nerves passing out of the spinal canal at the upper part of the opening, run across the cavity of the tumour to its posterior wall, where they are firmly fixed, the nerves being here flattened and spread out upon a fine membrane. From the sac, the anterior branches of the first four sacral nerves return in distinct bundles, forming large loops, to the anterior sacral foramina, through which they pass as usual to form the sacral plexuses. The fluid had evidently been effused between the visceral arachnoid and pia-mater; and the walls of the sac were formed by the visceral and parietal arachnoid and by the skin, all of which were much thickened, and firmly united to each other.

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In cases like this, in which the cord and its nerves pass *through the cavity* of the tumour, it is probable that the fluid was originally effused in the *subarachnoid* cellular tissue, after *partial* adhesions had formed between the cord with its nerves, and the two layers of arachnoid covering its posterior surface. But in some cases the cord and its nerves are found spread out upon the posterior wall of the sac, without passing *through* its cavity; and in these most probably the fluid was effused into the subarachnoid cellular tissue, after *extensive adhesions* had united the cord and its nerves to the two layers of arachnoid covering its posterior surface. Whereas, if the fluid be effused into the *cavity of the arachnoid*, before any adhesions form between the two layers of that membrane, no nerves will, in Mr. Hewett's opinion, be connected with the sac.

Terminations.—The tumour formed by a spina bifida, may vary in size from that of a turkey's egg to that of an adult head; and its integuments may be thick and covered with a dense cuticle, or may be thin and transparent. In some cases the tumour bursts during the act of birth; in most others, after the patient has lived some months or years, it becomes enormously distended, and ulcerates, the patient speedily dying of the irritation. In one case, of a young woman, aged 27, which came under the author's observation some time ago, and which was afterwards under the care of Mr. Walsh, the tumour relieved itself when distended, by the exudation of a watery fluid through a minute aperture. In some few cases the patient lives to the ordinary span of life, without being much troubled with the deformity. There is, further, a great variety in the amount of inconvenience attending it. Sometimes it is combined with congenital hydrocephalus; sometimes with club-foot; sometimes with more or less palsy of the legs, or incontinence of urine (which symptoms are easily accounted for by the wasted and compressed condition in which the cord and its nerves are often found), whilst in other cases there are none of these inconveniences, unless the tumour is compressed or inflamed.

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* Represents the tumour formed in spina bifida. From the King's College collection.

Treatment.—We have been thus minute in describing the real nature of this disease, in order to deter the surgeon from hazardous attempts at curing what must almost inevitably be an incurable malady. We read of cases in which the tumour has been cut off, and the edges united by twisted suture; or, in which it has been included in a ligature and tightly tied; but these plans will not be readily adopted by any one who would rather not open the spinal membranes, or injure the *cauda equina*. The operation of puncture, too, is generally followed by speedily fatal results. Therefore, we think the surgeon's wisest plan is, merely to apply moderate support by means of a hollow truss, or some such contrivance, so as to counteract that tendency to effusion which there always is when the natural support of any part of the body is taken away.* If the swelling increase very fast, and the surgeon is inclined to try the effect of a puncture, he should, at all events, strictly observe the following rules laid down by Mr. P. Hewett.

1st. "The tumour should never be punctured along the mesial line, especially in the sacral region; for it is generally at this point that the cord and its nerves are connected with the sac. The puncture is to be made at one side of the sac, and at its lowest part, so as to diminish the risk of wounding any of the nervous branches.

2nd. "The instrument ought to be a needle or a small trocar; for, if a lancet is used, there will be a greater risk of wounding some important part contained in the cavity of the tumour."†

After puncture, very great attention should be paid to proper support by bandages.

VII. CANCER of the Spinal Column. When severe and continued pain in some part of the spine, with more or less derangement of the nervous functions, and perhaps some perceptible tumour, occur in a patient affected with cancer, the probability is, that some of the morbid growth is deposited in or near the vertebræ.*

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* See a successful case treated by Sir A. Cooper in this way, Med. Chir. Trans., vol. ii.

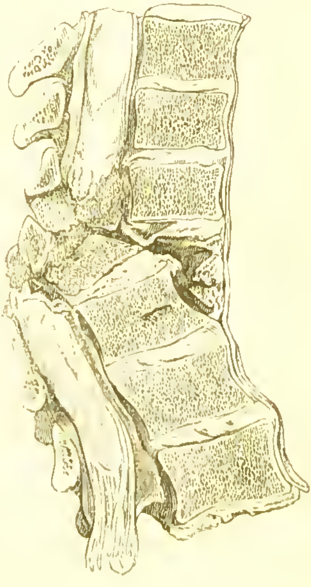
† See Cases of spina bifida, with remarks by Prescott Hewett, Lond. Med. Gaz., 1844.

SECTION II.—INJURIES OF THE SPINE.

I. CONCUSSION.—Violent blows or bendings of the spine are liable to produce very serious injury to the spinal cord. Sometimes they cause an immediate paralysis of the parts below the seat of the injury, which gradually passes off, and thus resembles the effects of concussion of the brain; sometimes they are followed by inflammation, which requires prompt antiphlogistic measures, in order to avert permanent paraplegia or death.

II. EXTRAVASATION OF BLOOD.—A severe blow on the back sometimes causes an extravasation of blood into the spinal canal, which, as it increases, causes compression of the cord, and paraplegia.

III. DISLOCATION AND FRACTURE.—Dislocation of the spine is rare, except in the cervical region, but it occasionally does occur even in the lumbar and dorsal without any accompanying fracture. When fracture occurs, it generally passes transversely across the body and arch of the vertebræ. The ill consequences of these accidents, will, of course, be proportioned to the amount of injury inflicted on the spinal cord; and if that escapes compression, the consequences may not be serious. Thus it may happen that one or more spinous processes may be broken off; or that the cervical vertebræ may be twisted round; and the last dorsal and first lumbar vertebræ have been displaced backwards, the patient recovering with permanent deformity, but nothing worse.†



But it more frequently happens in fracture and dislocation of the vertebræ, that the spinal cord is compressed or lacerated, and the parts below the seat of injury deprived of their nervous influence; and in these cases the symptoms vary, according to the level of the injury.

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* Cæsar Hawkins, Med. Chir. Trans., vol. xxiv.

† Guérin, L'Expérience, Dec. 3, 1840; Shaw, Med. Gaz., vol. xvii., p. 936.

If the injury affect one of the *lumbar* or *lower dorsal vertebræ*, the legs and lower part of the trunk are palsied and insensible, the penis is erect, the fæces are discharged involuntarily, owing to palsy of the sphincter ani; but the urine cannot be voided voluntarily, owing to palsy of the muscular coat of the bladder. Immediately after the injury, the secretion of urine is diminished, but in a few days it becomes copious, ammoniacal, and offensive, and the mucous coat of the bladder inflames, and secretes a quantity of viscid adhesive mucus. The bowels are distended with wind, and obstinately costive; in protracted cases the evacuations become black, treacly, and extremely offensive. The temperature of the palsied parts at first rises—in one case so high as 111° F.—but afterwards sinks to the natural level, or below it. In some few cases, in which the spinal cord is not entirely compressed or lacerated, the patient may retain some degree of sensation or motion, or may suffer from painful spasms of the legs; but in general the loss of feeling and motion is complete.

If the fracture or dislocation be *high in the back*, or at the *lower part of the neck*, there will, in addition to the above symptoms, be palsy of one or both arms, and great difficulty of breathing, especially of *expiration*, because the intercostal and abdominal muscles are palsied, and the diaphragm has no antagonist.

If the injury be *above the origin of the phrenic nerve* (fourth or fifth cervical), the diaphragm will be palsied, and death instantaneous. The most frequent example of this is the dislocation of the odontoid process, which is sometimes caused by ulceration of its transverse ligament, sometimes by blows on the back of the head, or by lifting a child up by the head.

IV. SOFTENING is a frequent consequence of concussion or laceration of the spinal cord. The affected part becomes pulpy and diffluent, without, however, any traces of inflammation.

V. ACUTE INFLAMMATION of the spinal cord is a very rare consequence of injuries, except penetrating wounds, which generally prove speedily fatal in consequence. It is known by rigors, delirium, twitchings, and numbness of the limbs; difficult and quick breathing; tympanites of belly; followed by paralysis of legs, possibly of arms; perhaps general convulsions and coma. Suppuration has been found along the whole of the spinal canal, and the pus has been known to make its way along the sheaths of the nerves, so as to form considerable collections amongst the muscles.*

Prognosis.—If a fracture is situated high up, so as to affect the respiration, the patient rarely survives more than a day or two. If it is situated in the lower part of the back, or loins, he may live two or three weeks, or a month; and, in some rare cases, recovery has even occurred, of course with permanent paraplegia. The manner in which death occurs after these injuries is from general exhaustion and debility. The appetite and digestion fail; a weakening diarrhœa comes on, and then the nates slough, and the patient soon sinks. The prognosis is very uncertain after severe blows; sometimes the patient lives and recovers the use of his limbs even after complete paraplegia; sometimes life is saved but with permanent paraplegia; sometimes, on the other hand, the patient having appeared to recover from the ill effects of the injury, most unexpectedly becomes paralytic, and dies from slow disorganization of the cord.

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* See case of latent fracture of spine, proving fatal by suppuration within the vertebral canal, by Mr. Simon, Pathological Trans., vol. vi. Dr. Bristowe, *ib.*

Treatment.—1. If there be any displacement, an attempt may be made to reduce it by extension. In partial dislocations of the neck, however, the attempt should be very cautious indeed, since, although it has succeeded (in the case of M. Guérin for instance), it has also been known to produce instant death. 2. The patient must be kept at perfect rest in the horizontal posture, and the greatest care must be taken to prevent or delay gangrene of the nates, by arranging pillows or India-rubber water-cushions. 3. The urine must be drawn off by the catheter, and the bowels be kept open by clysters and purgatives, to which Sir B. Brodie recommends ammonia to be added. Tonics and the muriatic acid may be given to support the strength, and obviate the derangement of the urine. The tympanitic state of the belly may be relieved by rubbing it with the compound camphor liniment. 4. Cupping may occasionally be employed if there are inflammatory symptoms, and the pulse is firm. But in the majority of cases, if fracture has occurred, and the cord is injured, loss of blood is contra-indicated by the pulse, and would hasten a fatal issue. 5. If the patient recover with his life, any remaining weakness or palsy may perhaps be attempted to be removed by the cautious use of blisters or issues, friction, warm bathing, and the internal use of nux vomica; but they will very rarely do any good.*

CHAPTER XII.

INJURIES AND DISEASES OF THE EYE.

SECTION I.—INFLAMMATION OF THE EYE GENERALLY.

I. The Eye is a very complex organ, containing very many different structures of great delicacy and minuteness. The effect of disease on each of these parts and structures requires to be considered separately; yet the student should be aware that he may not find in actual practice that the various diseases ending in *itis*, such as choroiditis, or sclerotitis, have such nicely-defined differences as are often assigned to them in books. For instance, it is a most arbitrary assumption that the choroid can be inflamed apart from the retina, or the retina apart from the choroid; still more to talk of congestion of the one, and inflammation of the other. No doubt there are many instances of isolated affections even amongst the most minute textures, as we shall show presently. But the first grand distinction the student must draw, is between inflammation of the conjunctiva, popularly, but falsely called *ophthalmia;* and inflammation of the eyeball. The conjunctiva, including that which covers the cornea, is a mucous membrane, subject to inflammation with mucous or purulent discharge, smarting or scalding pain, and more or less sensitiveness to light. This may be caused by various derangements of health; by long application with bright light; by atmospheric influence; or by the application of irritants, of which gonorrhœal pus is the most intense. It may lead to opacity and ulceration of the cornea, but be quite unattended with disease of the interior of the eye, and is greatly under the control of local astringent applications. In very severe cases, however, the deep-seated parts are apt to be implicated in the vascular action, although they may escape ultimately from the ravages of disease.

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* Vide Cooper on Dislocations, and Brodie on Injuries of the Spinal Cord, in Med. Chir. Trans., vol. xxi.

II. INFLAMMATION OF THE EYEBALL, on the contrary, is attended with quite a different set of symptoms;—those, in fact, which, as Dr. Jacob observes, are commonly ascribed to *iritis:* as if the iris were the only tissue concerned, whereas, in reality, in iritis, all the inner structures of the eye are more or less involved. The *symptoms* are, a bright pink arterial tint of the sclerotic; the iris altered in colour, first from increased vascularity, next from effusion; the pupil irregular, its contractile and expansive power diminished; dimness of vision; no great intolerance of light; pain, not scalding, but aching, or neuralgic, and of various degrees of intensity. Loss of transparency in the cornea, especially of the posterior elastic lamina, adhesions of the iris to the crystalline capsule; opacity of the lens and its capsule; softening of the inflamed cornea or sclerotic, so that they bulge under the pressure of the liquid within, fluidity of the vitreous humour, complete paralysis, or permanent bulging of the iris; loss of healthy structure of the retina, and various changes in the choroid, and effusion between it and the retina, are among the consequences of protracted subacute or chronic inflammation. Of the acute inflammation, attended with tensive agonizing pain, swelling of the eyelids, chemosis, flashes of light, and hot scalding tears, the consequence may be not merely effusion of lymph, with loss of transparency of the cornea and lens, but suppuration within the eyeball, indicated by shiverings, most acute pain, and a yellow distended cornea; which in such a case sloughs, if not slit open by the surgeon.

Causes.—Inflammation of the eyeball may be, 1, *traumatic*, that is, caused by injuries; 2, *idiopathic*, or caused by various morbid states of the blood.

1. The first, or traumatic form, may be caused by various injuries, especially blows and wounds; but the liability to it, and the severity of it will be greatly increased by intemperance, or any other circumstance

which deranges the general health. The *symptoms* will be those which we have already enumerated, in various degrees of severity, attended with furred tongue, quick pulse, headache, and fever. The *treatment* embraces all the points treated of in the Chapter on the Treatment of Inflammation in general. First, the causes—foreign bodies, chemical irritants, and the like—must be removed if possible. Secondly, soothing measures must be adopted to allay disturbed sensation;—perfect rest of the eye, and in all instances, especially if there be a wound of the eyeball, the eyelids should be closed by a narrow strip or two of court plaster; opium, to allay pain and to insure repose of body and mind; application to the injured part either of a bit of soft, dry, old cambric, or of a fold of rag dipped in cold water and frequently renewed; or of linen dipped in warm water, or in a warm decoction of poppies, whichever the patient finds most soothing; for if the one does not suit, the other must be tried. Thirdly, eliminatives; such as a good dose of calomel and colocynth with rhubarb and carbonate of potass, so as to drain the blood of cacoplastic matters. These complete the preventive measures. But if, notwithstanding, inflammation does come on, then, fourthly, the afflux of blood must be checked. If the patient, according to the signs detailed at p. 35, is able to bear it, venæsection may be performed. If not, from eight to twelve leeches may be applied to the temple, or cupping. The fourth indication will also be assisted by the use of saline purges, and saline draughts with small doses of tartar emetic. Fifthly, should the preceding measures not check the disease, or should bloodletting be considered inapplicable, mercury should be given gently, as directed for iritis, so as to control the effusion, or cause it to be absorbed. Lastly, the diet should be proportioned to the patient's strength, but not too low. The eyes should be protected from light; yet without sacrificing good ventilation and coolness. As the disease is disappearing, bark will often be of material service.

2. Of the various idiopathic inflammations of the eyeball, we will mention (*a*) that most *foudroyant* attack, which sometimes occurs in *pyæmia*; in which the eye is filled with unhealthy lymph, and destroyed with a rapidity that admits of scarcely any remedy. See *Pyæmia*. (*b*) Inflammation of the eyeball as a consequence of contamination of the blood from the poison of *syphilis*, is described under the head of *syphilitic iritis*; (*c*) that caused by rheumatism, common or *gonorrhœal*, is described under the heads of *sclerotitis*, and of *rheumatic iritis*. (*d*) *Scrofulous* affections are spoken of under the head of scrofulous iritis, and corneitis; and in the diagnosis of cancer, Sect 18, Strumous ophthalmia, commonly so called, is a disease of the conjunctiva, so far as it is a local disease at all. Lastly, one eye may be affected sympathetically by disorganization of its fellow; a thing to be averted by removing the cornea and evacuating the morbid products, or extirpating the eye after the manner of Bonnet.*

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* See a series of cases by Haynes Walton, illustrating this point, Med. Times,

SECTION II.—INJURIES.

I. WOUNDS of the eyelids or eyebrows should be most carefully adjusted by means of sutures, introduced with a very fine needle, which should pass through the cartilage, if divided. The glover's needle, figured at p. 128, is the best. The greatest care should be taken to prevent irregular cicatrization, with the distortion, and inversion or eversion, that may be the result of it. A linen rag wetted with cold water should then be laid on the part,—inflammation should be counteracted, and the patient be kept at rest till the wounds are healed. Wounds of the forehead, but more especially of the eyebrow, and of the margin of the orbit, even though the globe of the eye has not been struck, are occasionally followed by loss of vision, owing to concussion of the retina, or effusion of blood in the eye.

II. BLOWS on the eye are generally followed by a disreputable-looking ecchymosis, which is inconvenient enough. But sometimes a blow on the naked eyeball, even when so slight as to leave no trace of injury, or a severe blow on the temple, causes concussion of the retina, or some other deep-seated injury to the eye, dimness or total loss of sight; which, when neglected, may lead to permanent blindness.

For the prevention and treatment of ill-consequences, refer to the Section on Inflammation of the Eyeball generally.

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Blood effused into the chambers is generally absorbed in the course of a fortnight, if inflammation be kept down. If coagulated firmly, it will take much longer, even months.

Rupture of the eye may be caused by a violent blow, or explosion. Whether the contents of the globe are lost, entirely or partially, extreme quietude and care should be taken to save any remnant of sight, and to avert dangerous inflammation.

Dislocation of the crystalline lens is another possible result of a severe blow. If driven into the anterior chamber, and if the patient is young, and if it gives no trouble, it may be left to nature, especially if there be reason to think that the capsule does not surround it. If, however, it becomes irritating, or if the patient is above forty, it should be removed. If dislocated into the posterior chamber, it will almost certainly produce disorganization of the eye, if not removed by extraction; and it may be well to bring it into the anterior chamber by means of a needle, before the removal.

III. FOREIGN BODIES. When a patient complains of a foreign body in the eye, the surgeon should first examine the cornea; then the

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Feb. 18th, 1854; and similar cases by Mr. R. Taylor, ibid, Oct. 28th, 1854. The author most strongly recommends the perusal of a Treatise on Inflammations of the Eyeball, by Arthur Jacob, M.D., &c., Dublin, 1849.

* Gouge for removing foreign particles from the cornea.

inside of the lower eyelid and lower part of the globe, by everting the lid, and telling the patient to look up. If nothing is discovered there, the patient should turn the eye downwards, so as to expose the upper part of the globe, and the surgeon should turn the upper eyelid inside out, which may easily be done by taking the eyelashes between the finger and thumb, and turning the lid upwards over a probe. If any substance stick in the cornea, so that it cannot be removed by a probe, or silver toothpick, or fine forceps, the point of a cataract needle or lancet should be carefully passed under it so as to lift it out. A still more effective instrument is a sort of delicate scoop or gouge, introduced by Haynes Walton; for foreign bodies, when sharp and angular, and particles of hot iron often become so imbedded in the cornea, that they must be scooped out. Perfect rest to the eye should be enjoined, and every other means be taken to obviate inflammation. To remove particles of lime or mortar, the lids should be everted, and the eye be well syringed or sponged with weak vinegar and water, or with oil, or with pure water, if neither be at hand. For injuries with acids or alkalis, ablution or syringing with water is the readiest remedy. We may observe that whenever there is an inflammation of the conjunctiva, with a fair probability that it may have been caused by the intrusion of a foreign body, the strictest and most accurate search should be made; because an eye might be lost, or the patient subjected to weeks of illness, and of ineffectual treatment, if it were allowed to remain. Whenever a foreign substance has passed within the anterior chamber, if it can be seen and readily seized, it is better to extract it at once, if the surgeon possess the requisite skill and instruments, which are those required for the extraction of cataract. Mr. Bowman finds a drop of castor-oil the most soothing application in those very painful cases, in which the epithelium has been scratched or roughly stripped off from the surface of the cornea.*

IV. PROLAPSE OF THE IRIS, in consequence of penetrating wounds of the cornea, may be attempted to be reduced by closing the eye, and very gently rubbing the lid against the cornea, so as to press on the prolapsed portion, and afterwards by exposing it to a strong light, so as to cause the pupil to contract. Or a solution of atropia, F. 198, may be applied to the conjunctiva, and this, whether a portion of the pupillary margin be or be not prolapsed. In either case, if dilatation can be effected, there may be a favourable issue. Mr. H. Walton relates an instance in which reduction was effected by means of a probe. Dr. Mackenzie thinks that if the little bag of iris were emptied of its aqueous humour, it would often return immediately to its place, and suggests an attempt to empty it by pressure. Unless the reduction can be attempted immediately after the prolapsus, all chance of returning it is lost, because it soon becomes strangulated. When the prolapsed part cannot be returned, some surgeons have advised that it be snipped off, lest it irritate the eye; but in doing so there is *likelihood of pro-*

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* Bowman, Lectures on the Parts concerned in the Operations on the Eye, Lond., 1849, p. 120.

ducing further protrusion. In some rare accidents when a large part or nearly the whole of the iris hangs out, it may be prudent to remove a part; but, generally, the safer plan is to let it remain; all that is not required to plug up the opening will very soon be removed spontaneously. The protruded part, says Mr. Walton, rapidly cicatrizes over, with a partly opaque, and partly transparent cicatrix. Any application (such as the lunar caustic formerly recommended) interferes with the natural process.

SECTION III.—DISEASES OF THE EYELIDS.

I. HORDEOLUM, or sty, is a small painful boil at the edge of the eyelid, having most probably its seat in a ciliary follicle.

Treatment.—Poultices or fomentations; subsequently ung. hydr. nitrat. dilut., to remove any remaining hardness. Aperients, and afterwards tonics and alteratives, are always necessary, as the complaint always arises in debilitated constitutions.

II. OPHTHALMIA TARSI is an inflammation of the palpebral conjunctiva and the edge of the eyelids, with disordered secretion of the Meibomian glands—so that the eyelids stick together, and become encrusted with dried mucus during sleep. It may be *acute*—attended with great pain and soreness,—but in general it is chronic and obstinate, and attended with itching. It commonly occurs to weakly persons with disordered digestive organs. It may lead to ulceration of the eyelids, disease of the hair follicles, and loss of the lashes; sometimes to thickening and subsequent inversion of the edge of the lids.

Treatment.—In the first place, the health, which is always out of order, must be remedied by aperients, alteratives, tonics, change of air, bathing, and whatever other measures may be suitable for each particular case. Whilst there are much heat and swelling, the eyes should be bathed with an anodyne collyrium, F. 142, and the edges of the lids be smeared with lard at bed-time to prevent them from sticking together. But so soon as the bowels have been well cleared, an astringent collyrium, F. 140, may be used during the day, and the diluted unguentum hydrargyri nitratis be applied in very small quantity, with a small camel's-hair brush, to the edges of the lids at bed-time, F. 168. The lashes should be plucked out if there is any ulceration about their roots. Mr. Walton generally cuts them off even in the early stage of the affection, as this facilitates cure by enabling the applications to be more effectually made.

III. SYPHILITIC ULCERS of the eyelids, if primary, will be known by their sudden appearance and rapid progress in a patient otherwise healthy, and by their not having been preceded by a wart or tubercle, like cancerous or epithelial ulcers, and by their yielding to treatment. Secondary ulcers will be known by their coppery colour, and the general cachectic look of the patient, and presence of secondary symptoms in other parts.

Treatment.—The treatment of syphilis generally.

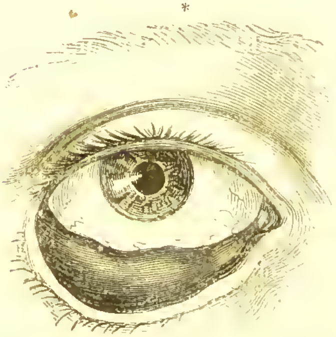
IV. TRICHIASIS signifies a growing inwards of the eyelashes. Sometimes the lashes which turn in, seem to constitute a second or distinct row, and the term *distichiasis* has been applied to this state. Mr. H. Walton has shown, however, that the appearance of this supposed independent row is a deception, and depends on the isolated position of the innermost lashes when inverted. *Causes.*—It seems to depend on some changes in the fibro-cellular tissue in which the cilia follicles lie, produced by irritation. The disease is exceedingly common amongst the lower orders, especially the Irish. *Treatment.*—If plucking the lashes proves ineffectual, an operation must be resorted to; and three are enumerated by Mr. Walton. One consists in the excision of a portion of skin from the lid, so as to give a sufficient outward tendency to the whole lid, to keep the inverted lashes away from the globe. An incision is made through the skin of the lid close and parallel to the lashes. A second incision is made to meet the extremities of the first, and to include an elliptical portion of skin between them, which is next dissected out, and the edges brought together by sutures. The other operation consists in the extirpation of the roots and bulbs of the offending lashes. An incision is first made along the edge of the lid through the skin, corresponding to the lashes that are to be removed. Two other short cuts are then made at each end at right angles, so as to form a small flap, which is to be lifted, and the bulbs of the hairs most carefully dissected off the cartilage. The skin is then to be laid down, and retained by a stitch. The third is a last resource, and must be done only as an extreme measure, and when there is so much thickening of the lid edge, and so much irregularity of the lashes, that neither of the others will suffice. It is to dissect away the hair follicles from the entire tarsal border.

V. ENTROPION has been attributed to a variety of causes, among which may be mentioned contraction of the ciliary margin of the lid, thickening of the conjunctiva at the line of reflection from the lid to the globe, contraction of the entire tarsal cartilage, and redundancy of the skin of the lids. Mr. Wilde has endeavoured to show that it is due to contraction of the conjunctiva *lining* the lid. Mr. Haynes Walton attributes its *immediate* cause to the unnatural action of that portion of the orbicularis palpebrarum muscle, which covers the edges of the tarsal cartilage, and which he states to be thicker, and more marked, than any other portion of the muscle that is on the cartilage.

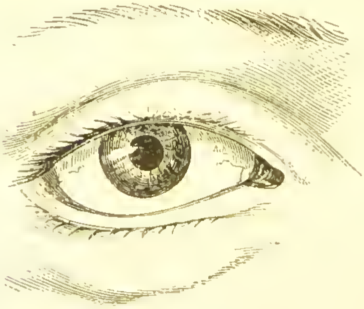
Mr. Wilde shows that the operations usually undertaken for the removal of entropion, such as the division of the tarsal cartilage perpendicularly at each angle, and suspending the lid after Crampton's method, under the idea of the contraction either of its edge or body; or the removal of any portion of the conjunctiva; or the cutting off the so-called redundant skin—do not answer; and recommends the plan of cutting off the cilia, leaving, however, the cartilage entire.

Among the other proofs that Mr. Walton adduces, of the power of the ciliary portion of the orbicularis muscle to act in the manner he describes, is the fact, that a colleague of his can invert his lids by the influence of the will alone. He proposes, therefore, the removal of the ciliary portion of the muscle so as to destroy the inverting power, and the removal of a portion of the skin of the lid to overcome whatever contraction the tarsus may have acquired. Simple division of the lid by a central slit has been recommended, and is adopted by some surgeons; and Mr. Walton says that this operation, by destroying the perverted action of the orbicularis, may in some instances answer, *i. e.*, where the tarsus has not acquired any permanent curve, but in the great majority it will not, it being necessary in addition to remove a bit of the skin of the lid also.

An incision is made along the edge of the tarsus, and close to its cuticular margin, from one angle of the lid to the other; and a second nearly parallel to it, about three lines distant, and joining it at its extremities: the knife being carried down to the cartilage, through both skin and muscle. Then one corner of this flap being raised by forceps, it is dissected clean off the cartilage, and the edges of the wound brought together by sutures.†



VI. Ectropion, or eversion of the eyelid, may be caused, 1. By a *thickening of the conjunctiva*, owing to long-continued inflammation. The weak ung. hydr. nitric. oxyd., or lotion of arg. nit. (gr. ii. ad ℥i), may be tried first, in order to bring the conjunctiva into a healthy state; but if they do not succeed, a portion of the thickened conjunctiva must be removed by a careful dissection along the edge of the lid; so that the parts may be braced up by the contraction that ensues: and it may be necessary besides to cut out a triangular slip from the tarsus. In the aged, the eyelid falls down from paralysis, and the exposed conjunctiva becomes thickened. 2. It may



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* The first cut represents an ectropion caused by a cicatrix; the second shows the successful results of the operation spoken of in the text.

† Vide Wilde on Entropion and Trichiasis, Dublin Journ. Med. Sc., March, 1844; Haynes Walton, Operative Ophthalmic Surgery, Lond. 1853, p. 157.

be caused by a *cicatrix on the cheek,*—that resulting from a burn, for instance. But by far the most common cause is the cicatrization resulting from the healing of abscesses at the edge of the orbit. Various operations have been suggested and practised for its removal, one of which consists of the removal of the cicatrix, and the subsequent transplantation of a portion of skin from the temple or the cheek, after the manner described in the observation on lost noses. It is a simpler and better plan to *transpose* the skin, as Mr. Walton calls it,—that is, to separate it freely to a considerable extent around, draw it to the position required, and retain it by sutures. It may also be necessary to remove a wedge-shaped portion of the tarsal cartilage.

VII. LAGOPHTHALMOS (hare eye) signifies an inability to close the palpebræ. Sometimes it arises from the contraction of cicatrices, and requires the same treatment as ectropion, when arising from the same cause. But it sometimes depends upon inaction of the orbicularis muscle, through palsy of the portio-dura; so that the levator palpebræ being unopposed, keeps the eye open. This may be caused by exposure to cold—on the outside of a coach, for instance: in which case it is attended with numbness of the cheek, and generally subsides in a few days with aperients, nursing, and perhaps a blister behind the ear. But it may be caused by a tumour in the course of the nerve; by disease of the part of the temporal bone through which it passes; or by congestion within the head, like the following disease:—

VIII. PTOSIS signifies a falling of the upper eyelid from palsy of the third nerve. Sometimes it is attended with headache, giddiness, and other signs of congestion in the head, which should be treated by bleeding, purgatives, and blisters. Sometimes it arises from debility, and may be removed by tonics. Sometimes it is an accompaniment of that form of amaurosis which arises from organic cerebral disease; and is attended with dimness of sight, a sluggish dilated pupil, and more or less strabismus: the eye being turned outwards and downwards because the external rectus and superior oblique are the only muscles unparalyzed. If it occurs without any assignable cause, and persists, notwithstanding the employment of every measure calculated to improve the health, a portion of skin must be taken out from the eyelid, so that the lid may be brought under the influence or action of the occipito-frontalis muscle, and be elevated by it. This must not be done, however, if, as Mr. Walton remarks, double vision should be caused by the eye being thus brought into use. This author says further, that the portion of skin to be removed must be taken near the eyebrow, else the lid may be everted, and should be dissected neatly out with a scalpel, so that there may be no scar.

IX. ANCYLOBLEPHARON.—Union of the edges of the lids, when complete and congenital (which is very rare), may be removed by an incision; when partial and consisting of a junction of the lids near one angle, which is sometimes caused by cicatrizing ulcers, it is incurable.

X. SYMBLEPHARON signifies a union of the lid to the globe, following some accident that has caused ulceration of both—the introduction of lime, for instance. It is irremediable, if the adhering surfaces are extensive. Very slight adhesions (fræna) may be divided; but the raw surfaces are too apt to adhere again. To prevent this, Mr. Walton divides the band vertically through its entire thickness, and brings the edges of each side severally together by sutures.

XI. TUMOURS of the lids may be of many varieties. Warts, enlarged cutaneous follicles, and vascular tumours, or *nævi*, are to be treated the same here as elsewhere. Cysts of hydatids (p. 162) may grow beneath the loose fold of conjunctiva which passes from the inside of the eyelid to the surface of the eyeball. If that fold be divided longitudinally, the hydatid will escape, or may be extracted by a hook or forceps. There is one small tumour found here, and called, *par excellence*, the *tarsal tumour*, the true nature of which the writer has examined, in concert with Mr. H. Walton. It consists of one of the acini of the Meibomian follicles, filled by thick sebaceous matter. If it projects on the inner surface of the lid, it is readily recognized as a small darkish speck, which may ulcerate and discharge its contents. If it chance to project on the outer surface of the so-called tarsal cartilage (for it must be observed that the Meibomian follicles are not, as is usually said, on the inner surface of the cartilage, but are contained within its very substance), then the obstructed follicle, having no means of emptying itself, forms a small tumour, which increases by the addition of fibro-plastic matter to its exterior. Such tumours may be felt under the skin and orbicularis, attached to the outer surface of the tarsal cartilage. On everting the lid, a slight depression is noticed within. A sufficiently free puncture should be made from within the lid, the cyst broken up with a probe, and the sebaceous and epithelial contents be evacuated.

XII. PEDICULI.—These loathsome insects sometimes lodge about the roots of the eyelashes, and produce an obstinate itching. They are easily killed by any mercurial preparation; but the surgeon ought to be aware of their existence, as they might be mistaken for crusts of dried mucus.

SECTION IV.—DISEASES OF THE LACHRYMAL APPARATUS.

I.—THE LACHRYMAL GLAND is occasionally subject to acute and chronic inflammation—the symptoms and treatment of which will be obvious.

II. XEROPHTHALMIA signifies a dryness of the eye from deficiency of the tears, or rather of the mucous secretion of the conjunctiva. It may be palliated by the occasional application of glycerine, or of a tepid lotion of infusion of quince-seed, by means of an eye-cup. Mr. Taylor has succeeded in two instances in restoring useful vision by keeping the cornea constantly moist with glycerine.*

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* See his excellent paper on this disease in the Edin. Med. and Surg. Journ., No. 198, new series.

III. EPIPHORA signifies a redundancy or over-secretion of tears, so that they run over the cheeks. It should be distinguished from the *stillicidium lachrymarum*, or overflow of tears, in consequence of an obstruction in the channels that convey them to the nose. It may depend on general irritability of the eye, and is not unfrequent in scrofulous children. When arising from this cause it should be treated by aperients and alteratives, with tonics and antacids (F. 38, 10, 11, 20, 76, 77). An emetic may be given if the stomach is foul. The same local applications may be used as are prescribed for scrofulous ophthalmia. Search should be made for foreign bodies or inverted eyelashes.

IV. CLOSURE OF THE PUNCTA LACHRYMALIA may be congenital, in which case it is quite incurable, or it may be a consequence of inflammation of the lachrymal sac and its appendages. Of course it produces a *stillicidium lachrymarum.* When a consequence of inflammation, it is only temporary, and passes off as soon as the inflammation subsides, to which the treatment should be directed. Actual closure of both puncta, except from the cicatrization of a wound, scarcely ever takes place, and the loss of only one does not matter much if there be no accompanying inflammatory affection, and the eyelids are not displaced. The treatment to be adopted when both are obliterated, and the canaliculi are not destroyed, is, according to Mr. Bowman,* to cut across one of them close to the obstruction, and then slit up the canal on a probe. When an orifice cannot be so formed, he recommends opening the sac below the *tendo oculi,* and slitting up the canal near the obstruction on a probe run into it from the sac. For this to be successful, the obstruction should be sufficiently far from the sac to allow of the canal being slit up in the interval through the conjunctiva. When this cannot be effected, there should be made an opening between the sac and the inner corner of the eye, and a fistulous aperture be established by the presence of a foreign body. To ascertain whether there is actual stoppage in the passage, Anel's gold probes may be used. Bowman has also shown that every divergence of the lower punctum from slight eversion of the eyelid, the result of chronic inflammation of the conjunctiva, or disease of the skin of the lid, may produce *stillicidium.* To remedy this condition, he slits up the canal from the punctum, till the incision reaches that part of the mucous surface on which the tears collect or against which they rest.

V. OBSTRUCTION OF THE NASAL DUCT is most probably a consequence of thickening of the mucous membrane that lines it, and is, according to Mr. Walton, a scrofulous affection not uncommon in delicate young persons. The patient complains of *weakness* of one eye, which is perpetually watering; and of dryness of the corresponding nostril. The lachrymal sac distended with tears forms a small tumour by the side of the nose, from which tears and mucus can be squeezed upwards through the puncta, or downwards into the nose, if the obstruction be not quite complete. A case is related of complete obliteration of the bony canal of the nasal duct by bony deposit, in which a permanent opening was established from the eye to the nose.* Mr. Walton has lately met with a similar case in the person of a medical man. Obstruction mostly leads to

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* Med. Chir. Trans., vol. xxxiv.

VI. Chronic Inflammation of the Lachrymal Sac—tenderness of the sac, perhaps redness of the superjacent skin; irritability and constant tendency to inflammation of the conjunctiva, with mucous or purulent discharge. There is often great variation in the symptoms in the same case, especially at different seasons of the year; for there may be great suffering in winter, and scarcely any inconvenience in summer.

VII. Acute Inflammation of the sac is known by great redness, swelling, pain, and tenderness, at the side of the nose, implicating the eye, and attended with fever and headache. If it be not soon relieved the sac will suppurate and burst.

VIII. Fistula Lachrymalis signifies an ugly fistulous aperture at the inner corner of the eye, communicating with the lachrymal sac. It is the ordinary consequence of the three preceding affections, if unrelieved, and may be said to have five stages. First, it begins with *obstruction of the nasal duct;* the most prominent symptom of which is a perpetual watering of the eye. Secondly, this is followed by *inflammation;* which, thirdly, gives rise to *abscess;* and this, fourthly, by its bursting, causes the *fistulous aperture* from which the name of the affection is derived; whilst, fifthly, in old neglected cases, the lachrymal or superior maxillary *bone may become carious;* but this is

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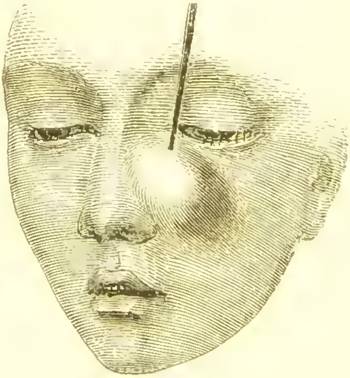

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* H. Walton, Med. Times, May 1846. A case is related in Forbes's Rev. xii. 611, of congenital absence of the nasal duct, in which M. Berard succeeded in establishing a communication with the nose.

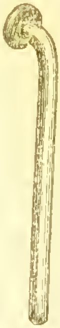
† Abscess of the lachrymal sac, after scarlatina.

not very common. The fistulous aperture is generally crowded with fungous granulations, and the skin around is red and thickened, from the perpetual irritation of the tears that escape from it. Sometimes there is considerable loss of skin.

Treatment.—Acute inflammation of the sac must be treated by leeches, purgatives, and cold lotions or poultices. If the pain increase in severity, and become throbbing, the sac should be opened in the manner to be presently described.

Chronic inflammation of the sac should be treated by an occasional leech; by steaming the nose so as to soothe and bring the whole track of mucous membrane into a healthier state, and by the strictest attention to the general health, and especially to the functions of the skin and of the digestive organs. When the sac becomes distended, the patient should endeavour to press its contents down into the nose; and he should also frequently draw in his breath strongly whilst his mouth and nostrils are closed, so as to draw the tears down the duct by the pressure of the atmosphere. The secretions of the eyelids should be corrected with citrine ointment (F. 168), and a few drops of some astringent collyrium (F. 140) should be put twice a day into the inner angle of the eye, so as to be absorbed by the puncta, and carried into the sac. By these means the thickening of the duct may perhaps be removed, or, at all events, the patient may go on pretty comfortably.

Treatment by the style.—But if the retention of the tears in the sac causes a constant irritability of the eye, or if there is a fistulous orifice between the sac and the cheek, measures should be adopted to restore the obstructed duct. If there is no aperture, the sac should be opened just below the *tendo oculi*, which, in a healthy condition, may be found by gently drawing the eyelids outwards, when it is seen as a small rounded cord, passing inwards from the inner canthus of the eye. But this guide is scarcely available when there is swelling and inflammation at the corner of the eye; then the operator must trust to his knowledge of anatomy, and to his surgical tact. Mr. Walton says that the correct place for the puncture corresponds to a spot a little below, and internal to, the lower punctum. The escape of tears and mucus shows when the sac is opened. Then a *style* should be introduced, *i. e.*, a silver or a silver-gilt probe, about an inch or an inch and a quarter long, with a head like a nail, with blunt edges, which lies on the cheek, where it passes unnoticed like a black patch.* It should be pushed downwards, but a little backwards and inwards through the duct into the



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* Mr. Walton covers the head of the style with a drop of black sealing-wax, melted on smoothly: this is better than black paint, though it will require renewal occasionally. He finds that a style with a round head, a little bent at the upper end, sits better, and irritates less; for when the head of it is merely bevelled off, the lower part of its circumference still rests on the skin and ulcerates it.

nose. It will be known to have reached the nose by the escape of a little blood. The constant presence of this instrument causes the duct to dilate, so that the tears flow by its side. It should be occasionally cleaned, and then be replaced; and it causes so much comfort, and the duct is so likely to close, if it be left off, (in neglected cases in which the mucous membrane has been destroyed,) that it generally is worn for life. In less severe cases it may effect a cure after being worn a few months. When the parts about the corner of the eye become healthier, the head of the style may be reduced in size. The above is the plan of treatment which the author has generally seen adopted; and the results have been on the whole satisfactory; but it follows of necessity that in so common a complaint many other plans of treatment are followed by different surgeons. Short pieces of catgut bougie, or silver tubes, are sometimes employed instead of the style. Sometimes attempts are made to restore the nasal duct to its proper calibre by introducing instruments from below; either a common silver probe, with its blunt end bent at a right angle, or else a steel probe made for the purpose; whichever is employed, should be passed along the inferior meatus of the nostril till its point is under the anterior extremity of the inferior turbinated bone, and then by manipulation it may pass into the duct; yet with the greatest care, this proceeding may inflict injury, and sometimes cause violent hæmorrhage. Bowman has suggested a plan of slitting up the canaliculus, and passing probes of different sizes through the enlarged aperture into the obstructed duct, thus catheterizing, as it were, the channel.

IX. THE LACHRYMAL GLAND is very rarely the seat of disease, and the author is not aware of any accurate dissections or microscopical examinations: moreover, it is pretty certain that other tumours in the outer part of the orbit have been mistaken for enlargements of this gland; and that a healthy gland has been occasionally removed unintentionally with such a tumour. Pain, preternatural flow of tears, and a lobulated tumour under the outer part of the roof of the orbit, are the symptoms; careful extirpation the remedy. See Section XVIII. Sometimes this gland is extirpated, in order to get rid of the flow of tears, in cases in which the eye has been lost, and the puncta closed by burns or other injuries, so that the tears are incessantly dribbling on the cheek. An incision must be made for this purpose along the edge of the orbit, through skin, orbicularis, and fascia, when the gland will be exposed, and both portions of it must be removed; for it must be recollected that it has two lobes, and that if either of these is left, the purpose of the operator is defeated.

SECTION V.—DISEASES OF THE CONJUNCTIVA.

1. COMMON ACUTE OPHTHALMIA consists of inflammation of the conjunctiva. *Symptoms.*—Smarting, heat, stiffness, and dryness of the eye, with a feeling as if dust had got into it; the conjunctiva of a bright scarlet redness; the redness superficial, so that the enlarged

vessels can be moved by pulling the eyelids; slight intolerance of light and *flow of tears* on exposure of the eye, and more or less headache and fever. *Causes.*—Slight local irritation, disorder of the digestive organs, or cold and damp.

II. CATARRHAL OPHTHALMIA is a variety of this inflammation caused by cold and damp, and attended with a thin purulent discharge, which in severe cases becomes thick, and doubtless contagious.

Treatment.—A dose of calomel followed by black draught, and preceded by an emetic if the stomach is very foul; the eye to be frequently bathed with poppy decoction, or the weaker forms of F. 140, lukewarm or cold, according to the patient's choice; the edges of the eyelids to be smeared at night with fresh lard, and with weak ung. hydr. nit. ox. after the first day or two; a green shade to be worn over *both* eyes, whilst there is much intolerance of light; but the patient not to be confined to the house too long, unless the case is very severe, or the weather bad. In the catarrhal variety, a large drop of solution of arg. nit. (gr. i. ad ℥i.) may be put into the eye twice or thrice a day. If there is much *pain*, leeches may be applied to the temples; and if the patient is plethoric, and there is much headache and fever, bleeding and calomel in repeated doses may be required. But it is a great mistake to treat common inflammation of the conjunctiva, when it occurs in delicate subjects, by lowering measures. After the bowels are cleared, a good diet, and exposure to moderate light and cool air, and an astringent lotion, will do more good than black draughts, leeches, and green shades.

III. CHRONIC INFLAMMATION OF THE CONJUNCTIVA may be a sequel of the acute; or may be caused by some local irritation, such as inverted eyelashes; or by some derangement of the health.

Treatment.—1. All local sources of irritation should be removed. 2. The general health should be amended, in the same manner as directed for chronic inflammation generally. (Vide p. 39.) 3. The distended capillaries must be unloaded by occasional leechings, and be excited to contract by stimulants and astringents, such as the various collyria in F. 140, &c., which should be used with an eye-cup; or the vinum opii (which Mr. Walton dilutes with an equal quantity of water), and of which a few drops may be put into the eye daily. The edges of the eyelids should be smeared every night with weak ung. hydr. nit.; and blisters should be applied behind the ears, if the case is obstinate.

IV. PURULENT OPHTHALMIA, or *purulent conjunctivitis*, is a very violent form of inflammation of the conjunctiva, and is attended with a thick purulent discharge, which supervenes in from twenty-four to forty-eight hours after the commencement of the disease. There are three varieties of it:—1, the purulent ophthalmia of children; 2, the common purulent ophthalmia of adults; and 3, the gonorrhœal ophthalmia.

THE PURULENT OPHTHALMIA OF CHILDREN, or *ophthalmia neonatorum*, always begins to appear a few days after birth; generally on the third day.

Symptoms.—At first the edges of the lids appear red, and glued together; their internal surface is red and villous, and the eye is kept closed. Then the conjunctiva of the globe becomes intensely scarlet and much swelled, often so much so as to cause eversion of the lids; it secretes a thick purulent discharge, and the child is very restless and feverish. If neglected, this disease may occasion opacity or ulceration, or perhaps sloughing of the cornea; but it generally yields to early and proper treatment. Yet sometimes the interior of the eye is very much damaged, and the retina is left very feeble.

Causes.—In most instances in which the author has seen this disease, the mother has complained of some amount of *discharge* during her pregnancy. In some well-marked cases the husband has also had gleet; therefore it is not unfair to infer that this ophthalmia is caused by the contact of vaginal secretion during birth. Possibly irritation of the eyes from neglect of cleanliness may be a cause in other cases.

Treatment.—This disease, if submitted to early treatment, is easily cured by great attention to cleanliness, and by incessantly washing away the discharge with some mild astringent lotion. Either of the weak collyria (F. 117) will answer; and a large drop of a solution of one grain of nitrate of silver to an ounce of distilled water may likewise be put between the lids once a day with a camel's-hair pencil. The practice pursued at the Central London Ophthalmic Hospital; is to wipe away from the eye with a soft rag and warm water as much discharge as possible, then to apply with a syringe a lotion of four grains of alum to an ounce of water; after that, the edges of the lids are smeared with lard to prevent them from sticking together, and these proceedings are repeated every half-hour. Neither blistering nor leeching is resorted to. When the discharge is on the wane, the lids may be smeared at night with weak citrine ointment. The eye should be opened with very great delicacy by resting the fingers on the edges of the orbit, and then drawing open the lids in such a way as to avoid any pressure on the eyeball; because if the cornea is beginning to suppurate, it might easily be burst, and the lens be squeezed out. The bowels should be cleared with a grain of calomel or gray powder, followed by a little castor-oil or rhubarb. If the disease has been neglected, and there is great tumefaction, a leech may be applied to the temple, and half a grain of calomel be given every eight hours, for three or four doses. If the insides of the lids become thickened, a condition called *granular conjunctiva*, which never happens unless too strong a lotion has been used, the proper plan is to leave the injured eye alone, and to lay a few threads of cotton, spread with blistering plaster, between the external ear and the head, so as to create a discharge. If the cornea ulcerate or slough, or if the discharge be obstinate, tonics are required (quin. sulph. gr. ſs.—vel ext. cinchon. gr. iii. ex lacte), and the astringent collyria should be persevered with.

V. PURULENT OPHTHALMIA IN ADULTS (*Contagious* or *Egyptian Ophthalmia*). *Symptoms.*—This disease begins with stiffness, itching, and watering of the eye, with a sense of dust in it, and slight swelling of the lids, which stick together during sleep; and on examination of their internal surface, the palpebral conjunctiva is found to be intensely red, thick, and villous, like a fœtal stomach injected. As the disease advances, the conjunctiva covering the globe becomes also intensely red, swollen, and villous, and discharges a copious secretion of pus. The swelling of the ocular conjunctiva is called *chemosis*. It is produced by effusion of serum and lymph into the cellular tissue which connects the conjunctiva to the sclerotic; and it elevates the conjunctiva into a kind of roll around the margin of the cornea, which sometimes overlaps it entirely. These symptoms are accompanied with severe burning pain, extending to the cheek and temple, and great headache, fever, and prostration; the palpebræ also are swollen, tense, and shining, so that the patient cannot open the eye.

Consequences.—This affection may lead to ulceration or sloughing of the cornea; and very commonly to some impairment of vision, from extension of inflammation to the internal parts of the globe.

Causes.—It may be produced by severe local irritation, as the introduction of lime, for instance, or a blow. It is endemic in Egypt, owing to the glaring sunshine and the particles of sand with which the air is loaded. It may also be produced by the close damp atmosphere, saturated with animal vapour that results from crowding many persons together in a confined space, and from the neglect of cleanliness and ventilation; hence, its prevalence amongst the military in barracks; in schools; and on board ship—especially amongst the wretched inmates of slave-ships. But when once produced, by any cause whatever, it is most probably both *contagious* and *infectious*; that is, capable of being propagated both by contact with the purulent secretion, and by exposure to its vapour, if many persons affected with the disease are crowded together.

VI. GONORRHŒAL OPHTHALMIA is the most violent form of purulent conjunctivitis. The *symptoms* are essentially the same as those of the last species; but the disease seems to begin in the ocular rather than in the palpebral conjunctiva, the chemosis is greater, lymph being generally effused into the subconjunctival areolar tissue, the discharge thicker and more abundant, the constitutional disturbance more severe, and the cornea much more apt to slough. It is sometimes said that one eye only is usually affected; not both, as in the Egyptian variety; but both eyes are often affected, although usually at an interval of a few days, and that which is attacked last generally suffers the least.

Cause.—This disease arises without doubt from the application of gonorrhœal matter from the urethra to the eye.

Prognosis.—This is very unfavourable. The sight of the affected eye will either be lost, or excessively impaired, unless treatment be very early and efficacious.

Diagnosis.—If a patient applies with violent conjunctivitis, and there is a suspicion that he has a clap and has infected his eye, the surgeon should insist on an examination of the penis, however strongly the patient may deny the fact of his having any disease.

Consequences.—The most frequent and detrimental is *sloughing of the cornea.* The sloughing generally occurs quite suddenly; the cornea may be clear in the morning—cloudy and flaccid in the evening—and by the next morning it may have burst; and this change may supervene at any time from the second day of the disease till the last. After this has occurred, the swelling of the lids subsides, the discharge diminishes and becomes thinner, and the pain greatly abates. If the slough is very small, the iris may protrude, and close the aperture, imperfect sight remaining,—but generally the greater part of the cornea perishes; a fibrous deposit takes place on the iris, and becoming distended produces staphyloma: and all useful sight is lost.

Treatment.—There are three sets of measures which may be adopted in this very hazardous disease; viz., antiphlogistic remedies, scarifications, and astringents.

Experience has shown that it is not possible to check this disease entirely by antiphlogistic measures, such as bleeding, purgatives, calomel, and antimony, &c.; and that although they ought to be used in proportion to the violence of the fever with which the local disease is attended, yet that they cannot be trusted to entirely.

If the patient applies, at the very commencement, the use of an alum or a nitrate of silver lotion several times a day, indeed every hour, and fomentations of poppy, together with low diet, antimony, and confinement to bed, may suffice to check the disease.

But if the disease has reached its height, and there is great fever and headache, with full bounding pulse, it will be right to bleed freely, to purge, and to administer nauseating doses of antimony, and Dover's powder, at bed-time, to allay pain. The patient must be kept in bed, in a darkened room, with the head elevated, and on low diet. But if these measures, combined with the local applications to be mentioned presently, do not arrest the disease, and the chemosis is evidently extending round the cornea, and the cornea is becoming hazy, incisions, at equal distances, should be made completely through the swollen conjunctiva, beginning at the margin of the cornea, and radiating towards the circumference of the eye.* "A small curved bistoury must be introduced just where the chemosed conjunctiva overlaps the cornea, and the point be carried through the entire thickness of the swelling to the palpebral sinus, taking care not to injure the sclerotic coat, then the hand should be depressed, and the bistoury made to cut its way out. The incisions may be advantageously employed more than once in the same case, and are useful even when the conjunctiva is not extensively chemosed;"* but an eye may perish in spite of them, as of all other means. The patient, if unruly, should be narcotized by chloroform; if not, he should sit on a low chair, and the operator stand behind him, and raise the upper lid with a retractor, whilst an assistant depresses the lower. They should be fomented with warm water, that they may bleed. If there comes on, as frequently happens, an exacerbation of pain towards evening, it may be prevented by applying a few leeches in the afternoon, or by putting blisters behind the ears.

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* This practice was revived by Mr. Tyrrell (vide Med. Chir. Trans., vol. xxi. part ii., and Tyrrell on the Eye, vol. i., p. 73). It is mentioned by Astruc in the following terms:—"It was thought proper some time ago to try the same remedy in the eye tending to a mortification, as is made use of in other parts of the body when they are threatened with the same disease; viz., to *scarify the swelled conjunctiva thick and deep,* so that the globe of the eye, and especially the cornea, might be less compressed by it; for that sudden destruction of the eye seemed to be chiefly owing to its being too tightly embraced by the swelled conjunctiva."—Astruc on the Venereal Disease, translated from the Latin, Lond. 1754.

The eyes should be frequently but gently washed out, by means of a piece of fine sponge, or syringe, with warm water or poppy decoction, containing three grains of alum to an ounce, in order to get rid of the purulent secretion; and once or twice daily, a few drops of a freshly-made clear solution of one grain of nitrate of silver in an ounce of distilled water should be dropped into the eye by means of a camel's-hair pencil. As soon as the chemosis begins to lessen, the weaker preparations of F. 140 may be used. The diet also should be improved, and the edges of the lids should be smeared at night with weak ung. hydr. nit. ox. If the strength becomes impaired, or if the cornea has given way, tonics, especially bark, F. 1. 4, should be administered, which, with repeated blisters, and a continuance of the astringent applications, are the measures for removing the relics of the disease.

VII. SCROFULOUS OPHTHALMIA (*phlyctenular ophthalmia*) generally attacks children under eight years of age, but is not uncommon in adults.

Symptoms.—The characteristic feature of this disease is the extreme *intolerance of light;* quite out of proportion to any local visible disease. The lids are kept spasmodically closed, and the head turned obstinately away from the light; yet there is no general vascularity of the conjunctiva, but a little line of vascularity running towards the cornea, and terminating at one or more *phlyctenulæ*, or small opaque pimples (or sometimes pustules) at the margin of the cornea. This, like other scrofulous diseases, is extremely obstinate, and liable to recur frequently.

Treatment.—The first and chief point is to look after the general health, and especially to use moderate but effectual purgation, till the bowels are emptied, and their secretions rendered healthy. Three or four doses of calomel at bed-time, on alternate nights, with rhubarb and soda, or rhubarb and polychrest salt, F. 37, in the morning, will generally relieve the intolerance of light quickly; and when the tongue is cleaning, and feverishness has subsided, recourse must be had to tonics, cod-liver oil, and to the other general remedies directed for scrofula. Quinine is particularly recommended by Mackenzie, and a combination of quinine with sulphate of iron (F. 16, &c.) by Mr. Walton. Pure air is essential. *Secondly.* Various applications are recommended to relieve the distressing intolerance of light, such as cold lotions applied to the outside of the eye, and to the forehead and temples: or water to which a little vinegar or spirit, or nitric æther, has been added; or the white of egg curdled with alum, or warm poultices, or dec. papav. vel anthemid., or exposing the eye to the vapour of warm water, or to the vapour of laudanum or sp. camph., which may be put into a teacup and be held in warm water; but belladonna, F. 149, applied round the eye is the most efficacious, and small doses of extract of conium internally. *Both* eyes should be protected by a shade. *Thirdly*, in the advanced stage of the disease, benefit may be derived from dropping in a few drops of dilute vin. opii or lotion of nitrate of silver (gr. i. ad ℥i.) once a day, and especially from the application of dilute citrine ointment to the edges of the lids at bed-time.

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* Haynes Walton, Operative Ophthalmic Surgery, p. 271.

VIII. GRANULAR CONJUNCTIVA signifies a thick, rough, fleshy state of that membrane (especially of that part of it which lines the eyelids), and is a frequent consequence of severe and long-continued ophthalmia, or probably of treatment by applications of too irritating a kind. It causes great pain and disturbance to the motions of the eye, and, if it continues, will render the cornea opaque by its friction.

Treatment.—The directions generally given are, that the thickened part should be scarified; that, after one or two days, it should be touched with lunar caustic or sulphate of copper, that the scarification and caustic should be repeated alternately at intervals of two or three days, and that, if these measures prove fruitless, the thinnest possible layer of the granular surface should be shaved off with a fine knife or scissors. But it is a sounder plan of treatment to use counter-irritation on the outside of the eyelids, and improvement of the general health by tonics and change of air; and to discard any local application that causes pain or uneasiness, especially if this state of conjunctiva follows an attack of inflammation that has been freely treated by caustic. When the malady is idiopathic, the system is, according to Mr. Walton, much below par, and requires tonics. It is *the* complaint of the poor Irish.

IX. PTERYGIUM is a peculiar alteration of the conjunctiva,—a triangular portion of which, with the apex towards the cornea, becomes thickened, elevated, red, and fleshy. It may spread over the cornea and obstruct vision; but it does not cause much inconvenience besides, and is not essentially an inflammatory affection, although it sometimes follows protracted ophthalmia. It is most common in warm climates, such as Calabria: the examples seen in London are chiefly in persons who have returned from the West Indies. The author would suggest the affinity of this growth to the *cheloid* tumour of the skin.

Treatment.—If the disease is increasing, excision should be performed. The growth should be seized close to the cornea with tenaculum forceps, should be cut quite across, and be dissected off, towards the internal canthus. But yet, as Mr. Walton directs, that portion which covers the cornea should not be meddled with, because after the operation that will probably waste; neither should the semilunar fold and caruncle be extirpated.

X. TUMOURS, such as warts, polypi, fibro-plastic, and even enchondromatous growths, may spring from any part of the conjunctiva, whether near the cornea or not. Early excision by curved scissors is the remedy.

SECTION VI.—DISEASES OF THE CORNEA.

I. ACUTE INFLAMMATION OF THE CORNEA, or *acute corneitis*, is generally a consequence of neglected injury. The part becomes red and opaque, the sclerotic around highly vascular; and ulceration of the cornea, or suppuration between its layers, or abscess of the anterior chamber, may ensue. Local bleeding, mercury with antimony (F. 63), and fomentation, are the remedies. Stimulating applications are prejudicial. Turpentine in the dose of one drachm three times a day, in an emulsion with carbonate of soda and mucilage (F. 74), has been recommended.

II. SCROFULOUS CORNEITIS most frequently occurs between the ages of eight and eighteen.

Symptoms.—The cornea opaque, rough, and red, and unusually prominent; the surrounding sclerotic also red; pain and intolerance of light are generally trivial; there is some tendency to inflammation of the iris and retina; the pulse is frequent, and the skin dry.

Treatment.—For the acute, purgatives and fomentations. For the chronic, quinine perseveringly administered; blisters repeatedly applied to the nape of the neck, and behind the ears; and the general tonic treatment directed for scrofula. The vin. opii, and ung. hydr. nit. ox. to the eyelids are almost the only local applications admissible.

III. OPACITY of the cornea may be divided into two kinds. 1st. The opacity which results from the ADHESIVE INFLAMMATION, and effusion of fibrine between its layers, or between it and the conjunctiva, which is a very common consequence of inflammation of the cornea, and of scrofulous ulcers during their healing stage; and 2ndly, the opacity, or *leucoma*, which is produced by a loss of substance and its resulting cicatrix,—that which follows a pustule of the small-pox, for example. The former kind is in most cases curable; the latter generally not so.

When an opacity of the former kind is slight and diffused, it is called *nebula;* when denser and of a firmer aspect, *albugo*. Sometimes the lymph forming an albugo becomes vascular, and one or more vessels run to it from the circumference of the eye, and the cornea becomes red and fleshy; this state of things is called *pannus*.

Treatment.—1. All sorts of irritation about the eye or lids, and most especially inverted lids, or inverted hairs, or granular conjunctiva, must be removed, and any existing degree of inflammation be counteracted by proper measures. Then, 2, absorption of the lymph may be promoted by counter-irritants, such as blisters or tartar-emetic ointment behind the ears; by measures calculated to improve the health; and by the application of stimulants to the eye. The ordinary applications are, caustic lotion (gr. i. ad ℥j.), or hydr. bichlor. gr. i.—ad aq. ℥j.; vin. opii; or, ung. hydr. nit. ox. Whichever is selected should not excite long-continued pain or active inflammation. Gooch used to cure opacity of the cornea, even of long standing, and, in fact, other forms of chronic inflammation of the eye, by the administration of corrosive sublimate, in doses that would now be considered hazardous. He gave gr. $\frac{1}{4}$ twice a day; and in a few days' time increased the dose to gr. $\frac{1}{2}$, and then to gr. i. It caused feverishness, purging, slight sweating, and headache.

IV. LEUCOMA signifies an opaque cicatrix of the cornea. If recent, it may become much better spontaneously, or may be partially removed by the measures just indicated. If of long standing, it is irremediable, and sometimes becomes the seat of calcareous degeneration, a small particle of earthy matter being found in it, which may require removal because of its friction against the eyelids. Should *both* eyes be affected with leucoma, and should the opacity be exactly in front of the pupil, and so large that vision is lost, it will be right, provided that dilatation of the pupils by atropine does not improve sight, to make an artificial opening in the iris opposite some part of the cornea that is transparent.

Mr. Bowman has described a case of *warty opacity*, caused by the development of vascular papillæ, covered with hypertrophied epithelium; and relieved by shaving off the morbid growth to the level of the healthy cornea.*

Superficial Opacities.—"There are some varieties," says Mr. Bowman, "which appear to be on or near the very surface of the cornea, and which it is probable may occupy the anterior elastic lamina. The very opaque chalky-looking films which often follow the application of quicklime or new mortar to the eye, seem to be of this kind, and so, also, do those which have been supposed by some to be stainings of the surface of the corneal tissue by a deposit of the lead lotion in common use. Occasionally we have a superficial excoriation of the cornea—one can hardly call it an ulcer—which the epithelium limits with abrupt edges, thus favouring the accumulation, on the depressed surface, of the frothy mucus or sud which the movements of the lid furnish.

"The opacity thus produced is often very opaque, and unless you were aware of its cause, might seem more serious than it really is. A lens, or the point of a needle, will inform you of its real nature.

"There is another form of opacity, which I believe to have its seat in the anterior elastic lamina, although it is vain to endeavour to prove it, except by a section of the parts. It has a silvery lustre, and a very fine texture of interweaving striæ, and it creeps very gradually from near the border, over the surface of the cornea, towards the centre. The epithelial surface retains its smoothness and lustre, and the opacity does not appear to have much depth. Other varieties of opacity, very chronic in their course, and evidently not inflammatory, are liable to form, as I believe, in the same tissue. They may be of a brown tint, with an indefinite margin, and may affect both corneæ at the same time."

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* Op. cit., pp. 39, 122.

Superficial opacity, caused by a thin film of earthy matter, has been successfully removed by operation by Mr. Bowman,* Mr. Dixon, and Mr. Haynes Walton.

If the *acetate of lead* is used as a collyrium when there is any abrasion of the conjunctiva or cornea, a white precipitate is formed, which is liable to become fixed in the cicatrix as a dense white spot. The film may, however, sometimes be removed by a needle. The *nitrate of silver*, if applied too long, is apt to turn the conjunctiva of a deep olive hue.

V. ONYX signifies a suppuration between the layers of the cornea, and is an occasional result of acute ophthalmia, especially of the catarrho-rheumatic. It derives its name from its resemblance in shape to the white spot at the root of the finger-nail. It mostly disappears with proper antiphlogistic treatment. If it extend very fast it may be necessary to puncture the external layers of the cornea to relieve the great pain, but the sight will be lost.

VI. ULCERS of the cornea may be results of the *phlyctenulæ* of scrofulous ophthalmia, or they may arise from mechanical injury, or from any form of conjunctival inflammation. They may likewise commence as mere abrasions, or as little nebulous spots, independently of any other affection. When a consequence of the scrofulous phlyctenulæ, they are generally deep, and tend to perforate the cornea, and leave an opaque cicatrix; when arising from other causes, they are often superficial, and heal with a semitransparent cicatrix, which gradually becomes clear.

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"These ulcers may," as Mr. Tyrrell observes, "exist in three states." *First*, that which we may term healthy, when the surface and circumference exhibit a degree of haziness or opacity of a whitish or gray aspect, which is owing to the effusion of adhesive matter on the surface, and in the surrounding texture, which is essential to the healing of the part." In this state the case merely requires to be watched, to prevent injurious increase of action.

"*Secondly*, an ulcer may be inflamed, when its hazy circumference will be observed to be highly vascular. Leeches and counter-irritation, with soothing applications, are the remedies. But an ulcer is not necessarily inflamed because it has red vessels going to it; these bring materials necessary for its repair, and are not morbid.

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* Op. cit., pp. 37, 117.

† This figure exhibits the healing stage of an ulcer of the cornea. It is copied by Mr. W. Bagg from a drawing for which the author has to thank Mr. Partridge.

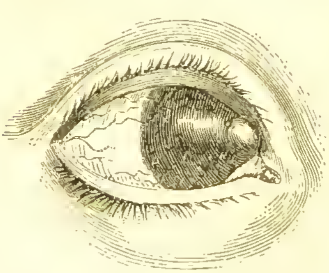
"*Thirdly*, an ulcer may be indolent, clear, and transparent, looking as if a little bit had been cut out of the cornea; without any vascularity or effusion of lymph. This state requires slightly-stimulating applications."

Again, ulcers may form on a surface that is already rendered opaque and nebulous by scrofulous inflammation. However, in any case, counter-irritation, and measures to improve the health, together with weak caustic lotion or vin. opii used twice a day, are the chief remedies. The surgeon should remember the tendency of the cornea to slough from insufficient and non-azotized food, as proved by the experiments of Majendie. The pupil should be dilated with belladonna, if the ulcer is near the centre of the cornea.

When an ulcer is very irritable, keeping up constant pain and intolerance of light, in spite of soothing applications, the best plan is to touch its surface with a finely-pointed pencil of nitrate of silver, so as to produce an insensible film on the surface: this is to be repeated at intervals of three or four days.

VII. Staphyloma is a term employed to signify any protrusion on the anterior surface of the eye. 1. *Staphyloma iridis* signifies a protrusion of the iris, which occurs when the cornea is perforated by ulcers or wounds. The term *myocephalon* is applied to the protrusion of a very small piece of the iris through an ulcerated opening in the cornea. For the treatment see p. 359.

2. *Staphyloma of the cornea* is said to exist when a portion or the whole of the cornea, whose texture has been disorganized by injury or disease has perished; and the cicatrix with which the iris has become covered, bulges before the pressure of the humours of the eye, and forms an opaque white prominence. If *partial*, it is usual to recommend that the nitrate of silver or butter of antimony be applied to the apex of the staphyloma, so that the inflammation excited may thicken the cornea, and enable it to resist further protrusion; the caustic to be well washed off with milk before the lids are closed. But besides sympathetically affecting the other eye, it is seldom that the use either of the nitrate of silver or butter of antimony checks the increase of staphyloma, and sooner or later the eye collapses from the necessarily extensive use of the knife. Therefore, when the staphyloma is still limited, Mr. H. Walton shaves it off; by which means the cut part frequently cicatrizes, and no further protrusion is effected. This treatment is applicable to small staphylomata, and especially those that rise suddenly, and have a small, well-defined base.



VIII. HERNIA CORNEÆ.—When the cornea is nearly perforated by an ulcer, a thin transparent vesicle is apt to protrude from the aperture, consisting of a thin lamella of the cornea; the posterior elastic membrane. The best plan is to keep the eyelids closed for a few days. Cicatrization to the edges of the cornea soon ensues.

IX. CONICAL CORNEA.—In this curious affection the cornea becomes exceeding convex, but remains transparent, and it often gives a peculiarly brilliant appearance to the eye. As it increases it causes almost total deprivation of vision, which, however, can be partially remedied by looking through a minute aperture in a piece of blackened wood, and sometimes by using concave glasses; sometimes by a combination of the concave glasses with the wood having the hole in it, or a perforated diaphragm set in a spectacle-frame. Tonics may be of service. See Artificial Pupil, p. 384.

X. ARCUS SENILIS is the name given to a circumferential opacity of the cornea, which has been shown by Mr. Canton to depend on fatty degeneration. As its name implies, it is most generally met with in the aged, and affects each eye symmetrically. When existing in one eye only, it is generally connected with some previous injury or disease which has spoiled the corneal tissue. Mr. Canton has pointed out that the arcus, when met with in early life, as at fifty, forty, thirty, or earlier, is often associated with fatty degeneration of the heart.*

SECTION VII.—DISEASES OF THE SCLEROTIC.

1 ACUTE INFLAMMATION OF THE SCLEROTIC is commonly called RHEUMATIC OPHTHALMIA; because the structure affected is similar to that which is commonly said to be attacked by rheumatism. But sclerotitis is, properly speaking, an inflammation of the sclerotic, and in some measure also of the cornea, iris, and other proper structures of the eyeball; and it ought not to be called rheumatic, unless there are pains in the joints, acid perspiration, or other evidences of the rheumatic diathesis.

Symptoms.—It is known by redness of the sclerotic,—dimness of sight, sometimes great intolerance of light, sometimes not—severe stinging pain of the eye, and aching of the bones around, which is greatly aggravated at night,—and fever. It may be caused by cold; and sometimes is a sequel of gonorrhœa; but it is a rare disease. It may lead to opacity of the cornea, or to iritis.

Diagnosis.—This form of ophthalmia may be distinguished from inflammation of the conjunctiva, 1st, by the character of the pain, which is a severe aching, principally felt in the eyebrow, temple, and cheek, and is greatly aggravated every evening; being excessively severe during the night, but remitting towards morning. Whereas, in conjunctivitis, the pain is of a scalding nature, and accompanied with a sensation as if sand was in the eye. 2ndly, by the character of the redness; which is deep-seated, and of a pale pink; and by the vessels running in straight lines from the circumference of the eye towards the cornea; whereas in conjunctivitis the redness is scarlet and superficial, and more vivid; the vessels are tortuous, and freely anastomose, and can be moved about with the finger.

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* Lancet, Jan. 11, 1851.

Treatment.—In severe cases, it is commonly said to be necessary to bleed generally or locally; at all events, to purge, and administer mercury with opium till the gums begin to suffer. But Mr. Taylor says, that he has seen severe cases treated by bleeding, leeching, and mercury, and that all have been made worse. The plan which he has found rather successful, is to give mercury in small doses, with bark or iodide of potassium, or with tincture of colchicum; and he says that blisters to the temple or eyebrow are sometimes useful. The pain may be relieved by friction of the forehead every afternoon, with extract of belladonna dissolved in warm laudanum (ʒj. ad ℥j.), or with mercurial ointment and opium, or F. 149,—warm pediluvia or warm bath,—blisters behind the ears,—and Dover's powder at bed-time. Dry warmth, by means of muslin bags filled with camomile flowers, and heated on a hot plate, is a very soothing application. In genuine rheumatic cases, tonics should be early resorted to, especially decoction of bark with potass, or with iodide of potassium.

II. CATARRHO-RHEUMATIC OPHTHALMIA is a combination of inflammation of the sclerotic with that of the conjunctiva. The symptoms of conjunctivitis, that is to say, roughness and sense of dust in the eye, muco-purulent discharge and superficial scarlet redness,—are combined with the deeper-seated, straight-lined redness, and with the zone around the cornea, and fits of nocturnal aching that characterize inflammation of the sclerotic. This disease generally occurs in broken-down constitutions, and is very apt to lead to onyx, and to ulceration of the cornea, and suppuration in the anterior chamber.

Treatment.—Warm opiate collyria, F. 142, weak citrine ointment, and the other topical applications for conjunctival inflammation, must be used in addition to the remedies prescribed for inflammation of the sclerotic.

III. TUMOURS OF THE SCLEROTIC require caution in meddling with them, lest the cavity of the eye be opened.

SECTION VIII.—AFFECTIONS OF THE ANTERIOR CHAMBER.

1. The term AQUO-CAPSULITIS has been applied to signify inflammation of the membrane of the aqueous humour. But it will be highly satisfactory to know, that as there is no such membrane, so there can be no such disease; and that the appearances commonly considered to denote this disease,—namely, a mottled opacity of the posterior layers of the cornea—really denote inflammation of the posterior layers of the cornea.*

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* See a Clinical Lecture by H. Haynes Walton, on the Non-existence of Aquo-Capsulitis, Med. Times, 5th May, 1855.

II. ENTOZOA.—The *Cysticercus Cellulosæ* (see p. 163) has on several occasions been found within the anterior chamber. In most of the recorded cases the patient has been the subject of one or more acute attacks of inflammation of the eye leading to opacity of the cornea. On examination a globular vesicle was discerned floating in the anterior chamber. It requires to be extracted by incision.*

SECTION IX.—DISEASES OF THE IRIS.

I. INFLAMMATION OF THE IRIS, or IRITIS.—The iris is exceedingly liable to inflammation, which generally involves also the sclerotic, the anterior capsule of the lens, and in fact most of the deeper structures in the eyeball. Dr. Jacob has well remarked, that "The use of the term iritis has the effect of directing the practitioner's attention to the iris, which bears a great deal of inflammation without destruction to the organ, and of withdrawing it from the retina, which bears very little, without permanent injury to vision."

Symptoms.—In the first stage, the fibrous texture of the iris is indistinct, appearing confused, and it loses its colour; if dark, it becomes reddish; if blue, it becomes greenish. The pupil, also, loses its mobility, is contracted and irregular. In the next stage, lymph begins to be effused; sometimes in the form of a thin layer, causing the surface to appear rusty and villous,—sometimes in small nodules; sometimes the pupil is filled with a film of it, sometimes, but very rarely, it is poured out in such abundance as to fill the whole cavity of the aqueous humour. The eye displays that kind of redness which arises from vascularity of the sclerotic; that is to say, a pink redness, with vessels running in straight lines from the circumference of the eye, and terminating in a vascular zone around the cornea; but in very acute cases the entire conjunctiva becomes injected likewise. Sometimes the cornea is slightly hazy. The patient complains of intolerance of light and dimness of vision, and of more or less burning, stinging pain in the eye; but besides this, there is also a severe neuralgic aching of the brow and parts around the orbit, coming on in nocturnal paroxysms.

Causes.—Iritis, as we explained in the first section, may be caused by injuries, or by over-exertion of the eye; but it more frequently depends on constitutional taint, syphilis, or gout.

Prognosis.—Favourable, if the disease is recent, although the impairment of vision may be considerable; but doubtful, if it be of very long duration, if there be much deep-seated pain, and especially if there be effusion of lymph behind the iris.

Varieties.—Iritis may vary in the degree of acute inflammation which attends it; being active and rapid, attended with bright redness, great pain, and fever, if it occurs in a robust plethoric subject; but in other cases, slow and insidious. It is also divided into several species, according to the nature of the cause producing it. Thus:—

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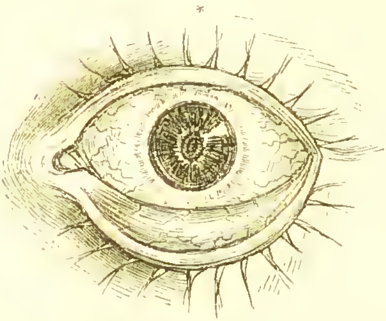
* See Mackenzie, Med. Chir. Trans., vol. xxxii.; Canton, Surgical Observations, Lond. 1853; Haynes Walton, Operative Ophthalmic Surgery, p. 502.



1. The *traumatic iritis* is that which arises from penetrating wounds of the eye.

2. *Syphilitic iritis.*—This is the most frequent variety. It is distinguished by the effusion of lymph on both surfaces of the iris, and in little nodules of a reddish or dirty-brown colour, which cause the pupil to become irregular. There is great pain at night, and but little by day, and secondary venereal affections of the throat or skin are usually present at the same time, or have preceded it. It may occur to infants who are affected with constitutional syphilis.

3. The *rheumatic* iritis arises under the conditions that cause the development of rheumatism in other organs. It differs from the syphilitic variety in the fact that there is less tendency to the deposit of lymph on the iris, and in the anterior chamber. The iris becomes dull and discoloured, *without showing nodules of lymph*, yet the pupil is more likely to become irregular and adherent; and the adhesion is, too, for the most part more general. Occasionally a little ring of fibrinous matter is deposited on the capsule of the lens, just within the circle of the adherent pupil. It is from such deposits, the accumulated effect of many attacks of inflammation, that the eye becomes destroyed. The surface of the eyeball is more inflamed, and frequently of a purplish-red colour, consequently there is not the definite zone of sclerotic redness that is usually so clearly defined in syphilitic iritis. The cornea, especially the posterior elastic lamina, is prone to become more or less opaque in patches, remains of which opacity may be permanent. But there is no greater characteristic of the disease than its tendency to return, insomuch that a person may have an attack once or twice a year, or at longer intervals, during a long life, and this, even after the pupil has been closed by plastic material. It may be well to state that a white ring around the cornea is present in all inflammations of the surface of the eye in which the cornea remains clear and vascular.

4. *Scrofulous iritis.*—This term may be used to signify either idiopathic iritis occurring in a scrofulous habit, and generally combined

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* A drawing representing the nodules of lymph effused in syphilitic iritis.

with corneitis; or else a deposit of cachectic lymph on the iris, which leads to scrofulous suppuration of the eyeball, or atrophy.

Treatment.—The indications are, 1, to subdue inflammation; 2, to arrest the effusion of lymph, and cause absorption of what is already effused; 3, to preserve the pupil entire; 4, to allay pain.

1. If the patient be strong, and the disease acute, with full strong pulse, and much fever, bleeding from the arm, or cupping from the temple may be requisite. The bowels must be well cleared, the antiphlogistic regimen generally be observed, without bringing the patient into a state of debility, and blisters be applied after the most acute stage has subsided.

2. To fulfil the second indication, the principal remedy is mercury; and the ordinary plan of administering it is to give gr. i—ii of calomel with gr. $\frac{1}{4}$—$\frac{1}{2}$ of opium at intervals of six or eight hours. But a most salutary change has come over the practice of surgeons in the administration of mercury, as well as in the use of bloodletting. It is now some years since, in attending a case with Mr. Walton, that the writer learned from him, with much satisfaction, the efficacy of small doses in iritis; such as two or three grains of hyd. c. cretâ, combined with hyoscyamus or conium, and given twice, thrice, or perhaps four times in the twenty-four hours, and the doctrine that the curative effect of mercury is almost always to be produced, short of salivation, which may well be termed one of the poisonous effects. If the remedy be thus gently administered, the dose being lessened so soon as the mouth begins to be tender, the lymph will generally be found to break up and gradually disappear, leaving the pupil clear. In debilitated or scrofulous subjects, and in tedious cases, tonics, such as bark, cod-liver oil, or iodide of potassium may be given with the mercury. Turpentine in drachm doses, F. 74, has been recommended in iritis instead of mercury; but its efficacy admits of doubt.

3. The pupil should be kept well dilated by means of a filtered solution of one scruple of extract of belladonna in an ounce of distilled water. But the most elegant way is to drop into the eye a solution of the *sulphate of atropine* (gr. i. ad ℥i. aquæ distill.). Stramonium and hyoscyamus have the same effect, but in a much less degree.

4. The pain must be relieved by nightly doses of opium, and the application of poppy fomentation to the eye, and the rubbing in of the unguentum opii to the temple.

In the *rheumatic iritis* the secretions of the liver and bowels should first be well cleared out by calomel with warm aperients; then the hyd. c. cretâ in very small doses twice daily, with colchicum, alkalis, and purgatives, and counter-irritants, are the best remedies. Pediluvia containing mustard should be used every night. The same plan of treatment will serve for the *gouty* iritis, if such a disease should be met with.

II. Synechia Posterior, adhesion of the *uvea* to the capsule of the lens; Synechia Anterior, adhesion of the iris to the cornea; and Atresia Iridis, or closure of the pupil,—three consequences of organization of lymph from protracted iritis,—may be partially removed by mercury, if recent, but are irremediable, except by operation, if of long standing. But belladonna should always be applied; because if a very small portion of the pupil is by chance unadherent, it may be dilated, so as to afford a very useful degree of vision.

III. Myosis—a preternaturally-contracted pupil—is sometimes met with in persons accustomed to look at minute objects, and is attended with great obscurity of vision, especially in a feeble light, because the iris is unable to dilate. To give repose to the eyes, and attend to the health, are the only available indications of treatment: Mackenzie says that belladonna is hurtful.

IV. Mydriasis signifies a preternatural dilatation of the pupil, which does not contract on exposure to light. This state, as is well known, is readily produced by belladonna and many other narcotico-acrid poisons; it is caused also by any injury of the brain affecting the *turbercula quadrigemina*, as in apoplexy and compression of the brain; and is often an attendant of confirmed amaurosis. But sometimes it seems to depend simply on a derangement of the nerves supplying the iris, without diminution of the sensibility of the retina; and this form of it may also be attended with ptosis; as a further evidence of paralysis of the third nerve. Sometimes it depends on gastric irritation and general debility, and is lessened as the health improves. If the retina is sound, which will be known by the perception of light, and by vision being improved by looking through a small round aperture in a piece of blackened card, concave glasses are often in service. One case is recorded which was said to be cured by ergot of rye, in scruple doses four times a day.* Generally speaking, in uncomplicated cases, the prognosis is good if a tonic plan of treatment be adopted. Mr. R. Taylor has seen good results follow a succession of blisters to the temple or brow, and the application of stimulating vapour—as of ammonia—to the eye. He also believes that nux vomica is of service.

V. Cysts filled with watery fluid, and growing from some part of the iris, may be mistaken for cysticercus, or dislocated lens; the chief distinction being that they have a fixed attachment. A cyst may be congenital, or may grow after some injury. If allowed to remain and increase, the whole eyeball becomes disorganized. The usual treatment recommended is, to incise the cornea, draw out the cyst, and cut it off. But this is a most severe operation, and one likely to be followed by the loss of vision; whereas Mr. Walton gives cases which show that if the cyst be punctured freely with an iris knife, it will collapse and give no further trouble. The operation may, however, require to be repeated.

VI. Artificial Pupil.—By this is meant an alteration in the shape or position of the pupil, or a new aperture in the iris, effected by surgical operation, for the purpose of allowing the rays of light to reach the retina.

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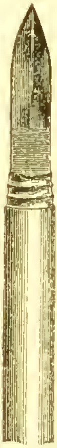
* L'Experience, Sept. 1839.

The *cases* in which such an operation may be expedient, are, 1, partial *opacity of the cornea*; 2, complete or partial *closure of the pupil by* lymph; 3, closure of the pupil from prolapse of the iris, or adhesion of it to the cornea, in consequence of ulceration or of wound of the cornea, which, in this case, is more or less opaque; 4, closure of the pupil, after the crystalline lens has been extracted or absorbed.

Respecting the various *forms of operation* which have been proposed for these and for the other combinations of circumstances that may be met with, we must content ourselves with detailing such general principles as every surgeon ought to be acquainted with; referring those who wish for fuller information to the works of Bowman, Wilde of Dublin, Mackenzie, Guthrie, Wharton Jones, Tyrrell, and Walton. Such particulars as we give are gathered chiefly from the "Operative Ophthalmic Surgery" of the last-named gentleman.



1. There is the operation by *incision* (*coretomia*), which is especially available when the pupil is closed, after the removal of the lens, and when the cornea is clear, and the iris tolerably healthy in structure, so that it is capable of retracting and forming a roundish pupillary aperture, after incision. The instrument employed is the *iris knife*, a lancet-shaped knife of various dimensions, according to the size of the aperture required. This is carried through the cornea, near its margin, across the anterior chamber, and thrust up to its shoulder into the iris.

2. The operation of *incision with extension* was proposed by Mr. Walton for cases in which, owing to loss of contractility in the iris, a sufficiently large aperture could not be made by simple incision. The iris is divided by incision, and then, by means of a fine blunt hook, the outer lip of the incision is drawn outwards till a sufficient opening is made.

3. A third operation, similar in principle to the last, is effected by introducing a very fine pair of scissors, through a wound in the margin of the cornea; thrusting one blade through the iris, and making first one cut, then a second, meeting at an acute angle like the letter V.

4. The operation of *excision* (*corectomia*) consists in incising the cornea, close to the margin, drawing out the iris by a hook or forceps (if it does not protrude of itself), and cutting out a small portion of it. This is applicable to cases of opacity of the cornea, with the iris and lens healthy; or to closure of the pupil from lymph, with adhesion to the centre of the capsule, without opacity of the lens or of the rest of the capsule; for it is now established that the centre of the capsule may be opaque from lymphy deposit after iritis, and the lens and rest of the capsule remain transparent.

5. Another operation adaptable to cases of closure, complete or partial, of the pupil, the lens being healthy, consists in puncturing the cornea, introducing the very fine canula forceps, seizing the iris close to

the pupil, and tearing away a portion of it; or else introducing a hook, seizing the edge of the pupil, and tearing a thin strip outwards.

6. The operation of *separation* (*coredialysis*), which consists in tearing away a portion of the circumference of the iris, is resorted to when there is central opacity of the cornea, with a portion of the circumference clear; the pupil being also closed from prolapse or adhesion to the cornea.

The best position for the pupil is as nearly central as possible: if it cannot be made central, it is better, according to Mr. Walton, at the inferior margin of the iris.*

But before resorting to any of these operations, it must be ascertained, 1st, that the adhesions of the iris cannot be removed by mercury or belladonna; or opacity of the cornea by external applications, aided by *time*, which, if the health be kept in good order, does much towards restoring every impaired organ to its normal condition; 2ndly, that the retina is perfectly sound; 3rdly; that all tendency to inflammation (syphilitic or otherwise) has ceased. It is not advisable to operate if one eye be quite sound; and supposing one eye to be irrecoverably lost, it is not advisable to form an artificial pupil in the other, provided the patient find his way about with it. Moreover, the new pupil should be made large, because it will always contract somewhat afterwards.

SECTION X.—INFLAMMATION OF THE CAPSULE OF THE CRYSTALLINE LENS.

This is a very rare affection, and always chronic. Vision is confused,—objects looking as if they were seen through a fine gauze. On examining the eye with a strong lens in a good light, the pupil being well dilated with belladonna, a number of minute red vessels are seen in the pupil. If the anterior capsule be affected, the vessels form a circular wreath of vascular arches with the centre clear; if it be the posterior capsule, they are central and arborescent. The iris is always slightly discoloured and sluggish.

Treatment.—Local bleeding, if necessary; mercury, counter-irritation, change of air, and alteratives.

SECTION XI.—CATARACT.

DEFINITION.—An opacity of the crystalline lens or of its capsule, or of both.

SYMPTOMS.—Before examining any patient with suspected cataract, the pupil should be dilated with belladonna, or F. 198, and then, if there be capsular cataract, there will be seen behind the pupil an opaque body of a gray dead-white; if lenticular cataract, of a bluish-white, or amber-colour. The patient usually gives as his history, that his vision has become gradually impaired; that objects appear of irregular outline, or multiplied, or as if surrounded with a mist, or as if a cloud was interposed between them and the eye. If lenticular cataract alone be present, he will say that the sight is better in the evening, or in a subdued light, or when the back is turned to the window; or perhaps after the application of belladonna or atropine,—obviously because the pupil, being dilated under those circumstances, permits more light to pass through that part of the lens which is as yet transparent, or which, though opaque, is thinner, and therefore affords less obstruction to light than the centre. In the most confirmed cases, the patient is yet able to distinguish day from night.

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* Vide Lecture, Med. Times for 1849, p. 331.

There is also the *catoptric test*,—that is, the mode of examining the eye by the reflection of light, which was proposed by M. Sanson. When a lighted taper is moved before the eye of a healthy person, three images of it may be observed. 1st. An erect image, that moves upwards when the candle is moved upwards, and that is produced by reflection from the surface of the cornea. 2ndly. Another erect image, produced by reflection from the anterior surface of the crystalline lens, which also moves upwards when the candle is moved upwards; and 3rdly. A very small inverted image, that is reflected from the posterior surface of the crystalline lens, and that moves downwards when the candle is raised upwards. To render this most distinct, the pupil should be dilated, and the examination be made in a dark room. Now, in lenticular cataract, this inverted image is from the first rendered indistinct, and soon abolished; and the deep erect one is soon afterwards abolished also. In capsular cataract, from the first, only the front erect image, that, namely, produced by reflection from the cornea, is visible. But the disease must be advanced, and the observer experienced, if this test is to avail; and the opthalmoscope gives the earliest means of detecting opacity of the posterior part of the lens.

Diagnosis will be spoken of under Amaurosis and Glaucoma.

Causes.—Cataract, especially capsular, is sometimes attributable to inflammation, and may be caused in a short space of time by wounds or other injuries of the lens and capsule, or of the eye in general. But the ordinary cataract of the old, seems to be a mere effect of impaired nutrition.

1. *Hard Cataract.*—This form is met with in elderly people only. It is caused, according to Mr. Walton, by grayness or opacity appearing in an already discoloured lens; and the greater the coloration of the lens, the less will be the amount of grayness required to obstruct vision. After thirty, the lens naturally acquires a yellow colour, and the hue becomes deeper, till it is like a piece of amber. The amber colour, therefore, the characteristic hue of cataract in aged persons, is not the effect of disease. Sometimes the colour is as deep as that of dark mahogany: and Mr. Walton has brought before the Royal Medical and Chirurgical Society the particulars of a case in which the cataract was so black that it could not be detected till the eye was examined with the ophthalmoscope, or the concentrated light of a powerful lens.

According to Mr. R. Taylor* the change in such cataractous lenses is twofold. The nucleus becomes hard and dry, to a degree far exceeding what is ever seen in the healthy lens; while the superficial layers are softened, frequently to the state of a semi-fluid pulp. The nuclear lens-tubes are hard, atrophied, and brittle, and are rendered more or less opaque by fine molecular deposit, as well as by little cracks and fissures. Those of the superficies are softened, and more or less disintegrated; they, also, are dotted over with fine molecular matter, which is also found floating free in masses, and filling up, and rendering opaque, many of the superficial lens-cells. This molecular matter is probably the result of the coagulation of the albuminous blastema by which the whole of the lens textures are pervaded.

The opacity generally commences in the superficial layers of the lens, for the most part in the form of streaks or radii, converging towards the centre, or, more correctly speaking, following the course of the natural divisions of the lens. Less frequently it commences in the nucleus, in the form of a cloudy opacity. When the disease is of long standing, the surface of the cataract frequently assumes a uniform milk or cream-white colour.

2. *Soft Cataract.*—While hard cataract is seen only in persons above thirty-five years of age, soft cataract may occur at any period of life. It appears to be due to disintegration affecting the whole substance of the lens, similar to that which affects the surface alone in hard cataract. The colour in infancy is bluish white, like milk and water: later in life there is generally less of the blue tint. The surface frequently presents an appearance like that of fractured spermaceti; or it may be traversed by radii and streaks, which glisten like a piece of tendon. In this variety vision is generally more imperfect than in the hard kind. The iris is frequently pressed upon by soft cataract; but this may also occur in hard cataract when the surface of the lens is much degenerated. This phenomenon is probably due, in the majority of instances, to the swelling of the diseased lens from the imbibition of moisture; but in other instances, the opinion of Mr. Walton is doubtless correct, that it is caused by unnatural vascularity in the deep-seated textures of the eyeball.

3. *Congenital Cataract* must, therefore, always be soft. In this variety vision is generally more imperfect than in the hard kind.

4. *Capsular Cataract.*—In this variety the opacity may be general, or may commence partially. It is almost invariably of a dead or chalky whiteness, scarcely ever shining, and always showing the same opacity in whatever position it may be viewed. It is not unfrequently the result of a slow inflammation, which may be accompanied with pain in the eye. It may be produced also by inflammation extending from the iris. Opacity of the *anterior* portion may be seen immediately behind the iris. That of the *posterior* appears at some little distance behind the pupil, and presents a concave striated surface, of a dull-yellowish appearance.

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* Pathological Transactions, vol. vii.

5. *Capsulo-lenticular* cataract is very common,—in fact, entire opacity of the capsule is always followed by opacity of the lens.

Treatment.—The cataract must be removed by operation. No other treatment is of any avail to get rid of the disease. It is, however, a general rule not to operate till the cataract is *mature*—that is, not whilst the degree of vision is sufficient for ordinary purposes; more particularly if the patient is very old and feeble, or if one eye is already lost; because, under these circumstances, a failure of the operation would entail utter blindness. Therefore the patient should assist his vision by dropping into the eye one or two drops of a carefully-filtered solution of extract of belladonna (℈i. ad ℥i.) in distilled water, night and morning, or F. 198, so as to dilate the pupil, and defer the operation till, despite of that aid, his blindness is complete.

Prognosis.—This will be favourable if the patient is in good health and of temperate habits; if the iris moves freely, and if the retina seems perfectly sensible to light. On the other hand, it will be doubtful if there are signs of vascular disturbance in the eye; if the iris is motionless or altered in colour; or if the cataract is complicated with amaurosis, softness of the eyeball, or glaucoma.

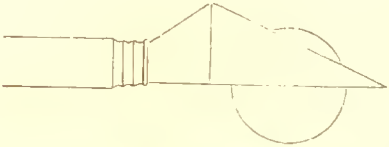
Preparation.—Before operating, the patient should be put into as perfect a state of health as possible. The state of the biliary, and more especially of the urinary excretion, should be examined, and purging, exercise, and low diet be enjoined, if the habit is inflammatory. But no rude lowering measures, or violent purgation, or sudden change of diet should be resorted to indiscriminately; and some patients require a better diet, with tonics and wine.

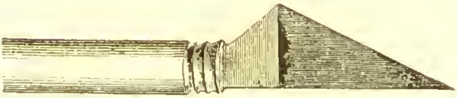
There are three methods of operating:—1, *extraction*; 2, *displacement* (or *couching*); and 3, *solution*, or the operation for causing absorption.

1. Extraction.—The object of this operation is, to make an incision through half of the circumference of the cornea, almost close to the sclerotic; to lacerate the capsule of the lens; and then to extract the cataract entire, through the pupil. Its advantage is, that it effectually removes the cataract; but it is the most difficult of all the operations for cataract, and demands, for its success, much knowledge and much practice. It is best adapted for hard cataracts in elderly people. But it should not be attempted, 1st, if the patient is very feeble, in case the wound of the cornea might not unite. 2ndly. If the anterior chamber is very small and the cornea very flat, so that a sufficiently large opening cannot be made in it. 3rdly. If the iris adheres to the cornea, or if the cataract pushes it forward against the cornea, thus rendering it impossible to incise the cornea without wounding the iris, or if the pupil is habitually contracted. 4thly. If the eye is sunken, or if the fissure of the lids is preternaturally small. 5thly. If the eyes are very unsteady, or if the patient is subject to habitual cough or asthma, or is unmanageable in consequence of idiocy. Some practitioners direct that one eye only should be operated on at a time, the other being kept as a reserve, whilst others operate on both together.

Operation.—In the precise manner of performing this, there are very many varieties. Some surgeons incise the lower, others the upper, part of the cornea; some sit before, others behind the patient; some are ambidexter, others use the right hand only. But, referring those who may wish for fuller information to the various works on ophthalmology before quoted, p. 385, we shall content ourselves with describing one method of operating which is, we believe, most generally employed at the present day.

The instruments required are, 1, a knife having a triangular blade; the back straight and blunt; the point sharp; the edge slanting obliquely; the blade increasing in thickness, as well as in breadth, as it approaches the handle. The advantages of this shape are, that it fills up the incision which it makes, and prevents the escape of the aqueous humour; and that the flap of the cornea is made by one simple motion, that is, by pushing the knife onwards. That used by Mr. Walton measures from the point to the shoulder $\frac{10}{12}$th of an inch, and across the broadest part $\frac{7}{24}$th of an inch, which gives a longer blade and a more acute angle than that shown in the drawing. But different operators use knives of different shapes.





2. A *curette*: an instrument with a curved needle at one end, and a small spoon at the other. Mr. Walton has devised a guarded curette, in which the hook is concealed till protruded by a spring. 3. A secondary knife to enlarge the incision in the cornea if required. 4. A sharp hook.

The patient may be either sitting, or lying on his back with the head properly supported, and in a good light. The operator, behind him, uses his right hand for the right, and his left for the left eye. An assistant draws down the lower lid, and steadies it against the malar bone, without pressing on the globe. The operator, with the forefinger of the non-operating hand, raises the upper lid and locks it under the edge of the orbit, just resting the point of this forefinger against the upper surface of the globe, and that of the middle finger against its inner surface, so as to steady it. Then holding the knife lightly with the thumb and first two fingers of the other hand, and resting his hand against the side of the face, he commences by—1. Puncturing the cornea at the centre of its outer margin, half a line, or even less, from the sclerotica. 2ndly. The blade is pushed gently across, parallel with the iris, in such a way that the point shall penetrate the other side of the cornea, exactly opposite to the first puncture; and that the edge shall cut an even semicircular flap of the upper half of the cornea. Just when the incision is completed, which should be slowly and carefully done, the eyelids should be dropped, and all pressure be ceased. 3rdly. Having waited a few seconds, the surgeon lifts the upper lid sufficiently to expose the cornea, tells the patient to look towards his feet, so that the globe may be directed downwards; then introduces the curette, and freely lacerates the capsule of the lens. 4thly. He makes *very gentle* pressure on the under part of the globe, and on the upper eyelid, till the lens rises through the pupil and escapes. Lastly, the eye should be opened after a minute or two, to see that the flap of the cornea is rightly adjusted, and that the iris is not prolapsed: if it is, the eyes should be exposed to a bright light, so as to make the pupil contract, and the prolapsed portion should be gently pressed upon with the spoon of the curette. Then the operation is finished.

Complications.—1. Sometimes, in consequence of the premature escape of the aqueous humour, the iris falls forwards under the edge of the knife. If the point of the knife is completely entangled in the iris, it is necessary to withdraw the instrument, heal the wound, and repeat the operation afterwards. If, however, a little bit of it should get under the edge of the knife, when the section is nearly complete, an attempt should be made to extricate it by pressing on the cornea just over it with the nail; but if this does not readily succeed, the operator may push on boldly, since, if a little piece of it be cut, it will be of no great consequence. 2. If the opening of the cornea is not large enough, it must be enlarged with the secondary knife. 3. If a portion of the lens remain behind, it should be left to be absorbed—unless it has passed into the anterior chamber, and can be removed very easily indeed. 4. If the vitreous humour seem disposed to escape, the cataract should be hooked out with the hook.

After Treatment.—The patient should be put to bed, with the shoulders raised, the room darkened, and with a very soft dry linen rag over both eyes. The bowels should be kept open, and everything be avoided which is likely to provoke coughing, sneezing, or vomiting. Mr. Walton allows the usual diet, at the usual times, only in rather diminished quantity; and this plan seems preferable to that of keeping the patient exclusively on slops. If all goes on comfortably, the eyelid may be raised on the seventh day, and then if there be no prolapse of the iris, and the cornea be united, he may get up occasionally, wearing a shade, sitting in a darkened room, and walking about a little. After a fortnight the eye may be opened in a weak light, and be gradually brought into use. But, inasmuch as it remains weak and irritable, the patient must take the greatest care to avoid exposure to cold, excess in diet, over-exertion of the eye, or exposure of it to too strong a light. Gray spectacles are the best protectors against too glaring a light. The patient will require convex spectacles for exact vision, but they must be used very sparingly for some weeks. He should have two pairs, one with a short focus for near objects, and another of long focus for distant objects.

The inflammation which may come on after the operation may be of two kinds. If the eyelids are swollen, and florid, and tender, and there is a thick yellow secretion about the lids, and the conjunctiva is red, swollen, and chemosed, the inflammation is acute, and requires to be treated by bleeding and purging. But if, as Mr. Tyrrell shows, the palpebræ are not much discoloured, and are œdematous, and if the secretion is thin and light-coloured, and the conjunctiva œdematous, the patient will be benefited by good broth, carbonate of ammonia, and opium.

II. Displacement, or Couching.—The object of this operation is to remove the cataract from the axis of vision. It is a clumsy and violent operation, and adapted only to those cases of hard cataract, of which the extraction would be unadvisable, for reasons mentioned in a preceding page. The disadvantages of it are, that the pressure of the lens on the ciliary processes and retina is liable to be followed by protracted inflammation or amaurosis; and that the lens may rise again to its old place, and obstruct vision as before. The preparation of the patient, his position during the operation, as well as that of the surgeon, and the duties of the assistant, are the same as required for the operation of extraction. The pupil should be dilated with atropine.

Operation.—A curved needle is passed through the outer side of the sclerotic, the $\frac{1}{6}$th part of an inch behind the margin of the cornea, and in the transverse axis of the globe. It is carried into the vitreous humour, the posterior capsule of the lens lacerated, then upwards and forwards behind the iris, and in front of the cataract; which then is steadily and gently pressed upon till it is carried downwards out of sight. It should be held down for a few moments to fix it, and if it rise again, it must be again depressed for a short time. Then the needle is withdrawn.

III. The Operation for producing Absorption is very easily performed, and excites very little inflammation; but it requires to be repeated several times, and the cure occupies several weeks or months. It is well adapted for soft cataracts, especially the congenital, but does not answer with the hard cataracts of old people. The instruments employed are needles, straight or curved; which are now made of great delicacy, strength, and sharpness. The pupil must be freely dilated.

Operations.—1. The needle may be introduced behind the iris in the same manner as for depression.

2. Or the needle may be introduced through the cornea, an operation now styled the anterior operation; formerly, *keratonyxis*. It is safer, simpler, less painful, and less injurious to the eye than the first mentioned: inasmuch as a wound of the cornea alone is less serious than one implicating vitreous humour, sclerotic, conjunctiva, and perhaps retina or ciliary processes. The needle is passed through the cornea about an eighth of an inch from its margin, and is made to lacerate the capsule to the extent of the pupil, so as to admit the aqueous humour to the substance of the lens; but without displacing or cut-

ting it into fragments, or, in fact, attempting to do too much. This operation is liable to be followed by severe pain and vomiting, if the cataract be so fluid that it mixes readily with the aqueous humour; or if portions of the cataract press on the iris; in the latter case, the irritation may be so severe as to render it necessary to perform extraction. The operation may require to be repeated after two or three months.

3. There is a third modification of this operation, which Mr. Tyrrell termed *drilling*. It is particularly adapted for cases of capsular or capsulo-lenticular cataract with adhesion of the pupil, caused by iritis. It is performed by introducing a fine straight needle through the cornea near its margin, and passing it through the pupil into the lens to the depth of about one-sixteenth of an inch, and rotating it freely. This operation may be repeated at intervals of four, five, or more weeks. It causes the lens to be dissolved by the aqueous humour; and if the puncture be made in a fresh place at each operation, that portion of the capsule which is behind the pupil may become loosened and detached. This operation may also, according to Mr. Tyrrell, be occasionally resorted to, in order to diminish the size of the lens, previously to depression or extraction.

Operation on Infants.—Congenital cataracts should be operated on early—within four months, if possible, lest the eye, which, when born blind, habitually oscillates from side to side, may never acquire the power of being directed to one particular object. The pupil being well dilated, the child, narcotized by chloroform to insure quietness, should be placed on a table—the head on a pillow, and rather hanging over it—one assistant holding the legs and trunk, a second the arms and chest, a third, fixing the head between his two hands, and a fourth, depressing the *lower* eyelid with one hand, and steadying the chin with the other. The operator then, seated behind the patient, performs the operation for absorption as before described. Care must be taken not to dislocate the lens. The operation on children, and, in fact, on persons under twenty, generally excites so little inflammation, that both eyes may be operated on at once, but the bowels must be kept open, and leeches should be applied if there be pain.

Capsular Cataract.—When congenital cataract of the capsulo-lenticular sort is left to itself, the lens often becomes absorbed, and the capsule, which is mostly tough or opaque, remains in the field of vision; and it sometimes happens that an opaque capsule is left, or that it becomes opaque after one of the operations for cataract. There are three plans of treatment. 1. A needle may be introduced, as for depression; and then may be made to tear through the opaque capsule, which then may shrink and leave the pupil clear. 2. The upper part of the capsule, for four-fifths of its circumference, may be detached by the needle from the suspensory ligament, and then be pushed down below the pupil. 3. If no other plan succeed, an opening may be made in the cornea, through which it may be extracted by means of a small hook or forceps. Mr. Middlemore has proposed a plan for removing such bodies through the sclerotic.

There is great uncertainty of clearing the pupil of capsule by any other mode but extracting it, yet so dangerous has that operation been deemed, from the escape of the vitreous humour, which is almost sure to occur when previous operations have been done within the eye, that the extraction is seldom attempted. To meet this difficulty, Mr. Haynes Walton has introduced into practice a peculiar sort of forceps for the removal of the capsule. The instrument is no larger than a needle, so that the opening in the cornea need not be larger than necessary to allow of the exit of the strip of capsule to be removed, and all the objections to extraction are overcome.*

SECTION XII.—GLAUCOMA.

GLAUCOMA was formerly defined to be a state of impaired vision, accompanied with a greenish discoloration of the pupil. The green appearance is in the eye of the observer. The disease is, in fact, disorganization of the eyeball.

Acute Glaucoma.—There is rapid loss of sight; the iris is dusky and thrust against the cornea by the lens, which is more or less discoloured; the pupil is large and fixed; the cornea loses its lustre; the epithelium gets uneven and may be vesicated. The sclerotic is discoloured, being darkish, with large tortuous veins, often without branches, purplish, or of a dark red. The eyeball is of stony hardness, and vision is nearly or quite extinct. There is very great pain. The disease is usually ushered in by occasional dimness of vision, and perhaps by an attack of inflammation; and always with pain in the eyeball, muscæ, flashes, or sparks. Any improvement is but temporary; blindness always ensues. Later the sclerotic is staphylomatous. Now and then there is atrophy of the eyeball.

Chronic Glaucoma is merely a manifestation of the same symptoms in less severity The ophthalmoscope shows enlargement of the retinal veins, ecchymosed spots about the retina, pulsation of the arteria centralis retinæ, small clots of blood in the vitreous humour, and a cupped or excavated state of the optic papilla.

Morbid anatomy shows the vitreous humour often yellowish from colouring matter derived from the extravasated blood, and thicker than natural; ecchymosis on the inner surface of the retina, with enlargement of the veins; dilatation of the retinal capillaries, with aneurismal enlargements filled with blood corpuscles. The lens has generally a yellowish tint, supposed to be due to the same cause that colours the vitreous humour. The choroid coat beyond being congested is scarcely altered, except where there has been staphyloma, when it is degenerated. The effusion supposed to exist between the choroid and the retina does not actually occur.

Treatment.—It is of no use to adopt any other treatment for the ordinary chronic glaucomatous degeneration of age, beyond abstinence from exertion of the eye and from anything likely to disorder the health. If the affection begin suddenly, with acute symptoms of a gouty character, as it does sometimes, they must be combated by cupping, counter-irritation, and the other remedies proposed for the rheumatic iritis. Opium must be freely given to lessen or subdue the pain.

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* See also Bowman on the Employment of Two Needles, Med. Times, Oct. 30th, 1852.

But Von Gräfe, who has made out more of the pathology of the disease than any other man, has suggested an operation for its *cure.* He makes a small linear incision in the sclerotica one millimeter behind the cornea, and removes a sixth of the iris. Von Gräfe gives no theory whatever, and candidly says that his practice is wholly empirical.

SECTION XIII.—THE OPHTHALMOSCOPE.

I. THIS instrument is to the eye what the stethoscope is to the chest. It has already rendered obsolete nearly all that had been written on the deep-seated diseases of the eye; for it has been the means of detecting changes unaccompanied with any objective symptoms, and not known till quite lately to exist. Its use is quite indispensable in all cases of impaired vision, not attended with extreme intolerance of light. Very seldom indeed does a patient complain, from the use of the instrument, except in cases in which such a result might fairly be expected, and might be avoided by ordinary caution.

II. The ophthalmoscope, in its simplest form, is a concave circular mirror of about ten inches focus, made of silvered glass or polished steel, and having a hole in the centre. As an appendage there is needed a convex lens an inch and a half in diameter, with a focus of from two and a half to three inches, set in a common eye-glass frame with a handle three inches long. The investigation must be made in a dark room. The patient's pupil should be dilated as a rule. The light of a candle is hardly sufficient, certainly not for beginners. An oil lamp is better, but by far the best is an argand burner that slides on a vertical rod.

The patient sits by a table, and the lamp is placed by his side close to his head, with the flame on a level with the eye, from which it is screened by a little flat plate of metal attached to the burner. The operator sits directly in front; and, holding the instrument close to his eye, and a little obliquely to catch the light from the lamp, he commences at the distance of about eighteen inches from the patient, to direct the reflection on the eye. When this is got, the convex lens must be held at the distance of two and a half inches from the eye and the focusing commenced, by moving them slowly backwards and forwards. When the light fairly enters the eye a reddish glare appears, and as it is focused, an orange-red or orange-yellow is seen; then the blood-vessels of the retina come into view. The retina itself presents a whitish aspect, through which the choroid is more or less discernible. The entrance of the optic nerve should now be sought; probably a part of it will already have been seen as a whitish spot: but the way to discern it properly is to make the patient look inwards. It appears as a whitish circular spot, in the centre of which are the central vein and artery of the retina, giving forth a variable number of branches usually six or eight.

The convex lens is not usually needed for examining near-sighted eyes, nor, in general, for the anterior structures of the eye. The annexed sketch (fig. 1) illustrates the above description, and accurately shows the proper position of the lamp, the direction of the patient, and the slightly-raised position of the observer.

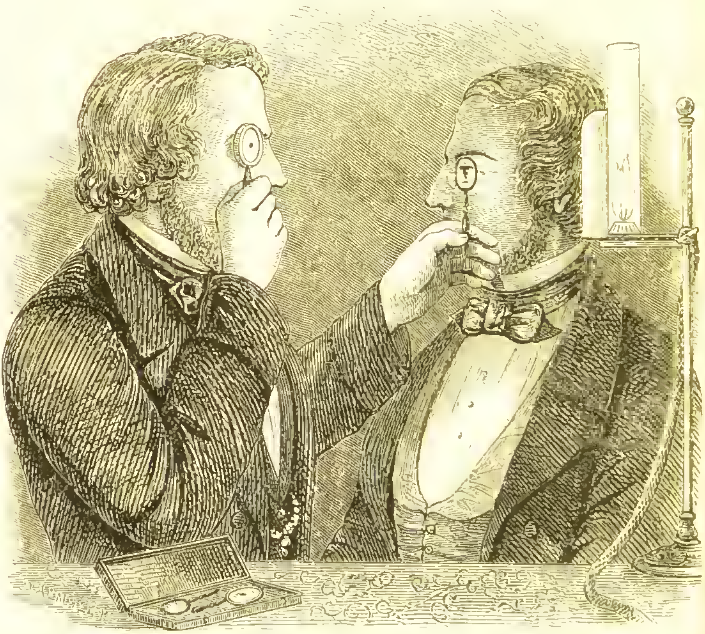

Fig. 1.

III. But what is the principle of the ophthalmoscope; why is a reflector needed; why cannot the eye be illuminated with the very lamp from which the light is borrowed? When a stream of light is thrown into the eye, the rays are reflected back by the retina and choroid, and, returning as they enter, are brought to a convergence at the spot whence they emanated. This takes place when any luminous body is held before the eye; hence when a candle or lamp is used, we see no illumination, simply because the flame is in the focus of reflection, and our eye cannot be there too, nor can it see through the flame. This difficulty is overcome by using a mirror with a hole in the centre (the ophthalmoscope), which represents the flame, and, by looking through the hole, we place our eye in the centre of the reflection, and thus see the lighted interior of the patient's eye. It is possible by certain arrangements of light, and position of the beholder, that the eye may be to an extent seen illuminated; but for the full effect, the ophthalmoscope is requisite.

IV. HEALTHY APPEARANCES.—The *arteries* and *veins*—the latter being larger and darker—radiate on the retina, and branch and anastomose almost to the ora serrata. No vessels cross the situation of the macula lutea.

It is not uncommon in eyeballs that are diseased to see the pulsation of these vessels; sometimes it may be seen in health, especially if the eyeball be pressed. Mr. Hulme has a patient attending at the Central London Ophthalmic Hospital, with pulsating retinal vessels, although the sight is unimpaired.

The *Choroid* must be focused to be examined. The irregularly arranged markings of a dusky hue indicate the vessels. The coloration of the choroid is darker in persons of a dark complexion, and of a lighter and less distinct shade in those of a fairer skin.

The *Retina* is a perfectly transparent colourless structure, and is best recognised by means of the vessels which pervade it. The arteries are of a smaller calibre, and have a more direct course than the veins, which are more tortuous, and of a darker colour, derived from their contents; but this last feature is not always well marked.

The *Optic Disc*, or termination of the optic nerve, as it enters the sclerotic, is the most important part to be noted in an ophthalmoscopic examination. In health it is circular in form, of a bright white colour, and perforated generally in its centre, but frequently in different parts of

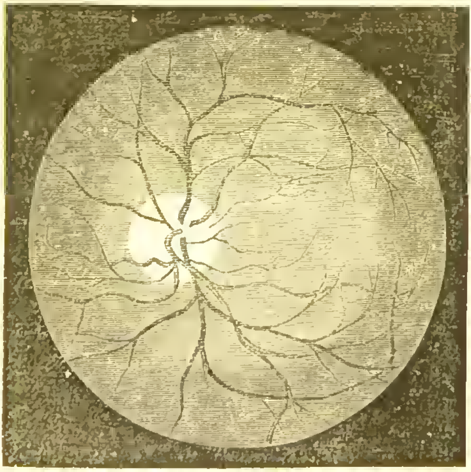

Fig. 2.

its surface, by three or four arteries entering the globe for distribution, and by as many veins which leave the interior of the eye. (See fig. 2.) A slight hyperemia of the disc is not incompatible with healthy vision.

The *Macula Lutea* is that part of the retina which lies directly in the axis of vision, and which is brought into view by causing the patient to look directly forwards. Frequently there is no particular structure to be made out, and the part is generally recognised by the absence of the retinal vessels, which seem to avoid this situation. Sometimes a paler, and at other times a darker appearance are the only indications of it. It must, however, be borne in mind that it is often the seat of hæmorrhages, morbid deposits, &c., which are always more or less detrimental to perfect vision. It should therefore be carefully examined.

The *Vitreous Humour*, the aqueous, the lens, and its capsule, and the cornea, are all parts which in the healthy state of the eye are transparent, and admit of a clear definition and observation of the whole of the posterior part of the interior of the eyeball.

V. Morbid Appearances.—Such is a description of the parts seen by the ophthalmoscope in the healthy state. We now propose, for the guidance of the student, to give an outline of the morbid appearances to be observed, premising that a thorough knowledge and use of this instrument can only be acquired by most careful practical study.*

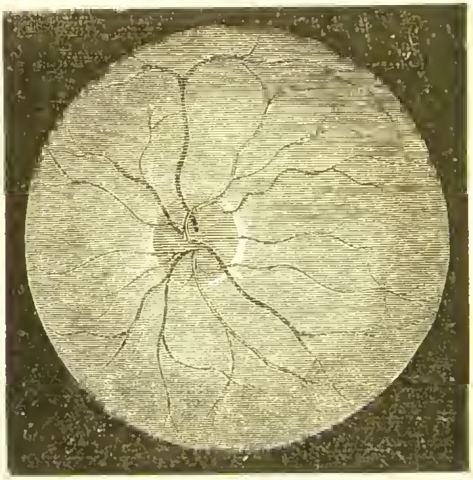

Fig. 3.

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* To those interested more especially in the diseases of the eye, as revealed by the ophthalmoscope, the following works are recommended for study and reference :—Edward Jaeger; Beiträge zur Pathologie des Auges, folio, Vienna; Ruete's Bildliche Darstellung der Krankheiten des Menschlichen Auges, folio, Leipzig. Desmarres, Maladies des Yeux, vol. iii., 1858; The Ophthalmic Hospital Reports, and Messrs. Taylor and Hulme's Ophthalmoscopic Sketches, now publishing serially in the Archives of Medicine.

The *Optic Disc* is the first point to which attention should be directed in an internal examination of the eyeball. The changes in the disc itself are so frequently connected with changes in the parts around its circumference, that during its examination, the state of these circumferential parts must be carefully noted.

Hyperemia of the Disc is of very frequent occurrence; the retinal vessels may be enlarged and dilated, and the veins varicose; in addition to which the surface of the disc may be seen finely injected, instead of showing its white normal appearance. This injection may proceed to such an extent as almost to hide the disc (fig. 3). Hyperemia of the disc is common in those cases of impaired vision from overwork, which are met with in the case of engravers, compositors, sempstresses, &c. Blood may be effused on the surface of the disc, constituting what has been called apoplexy of the papilla. Black pigmental deposits are occasionally seen on its surface, and frequently at its edge. The disc may present a cupped appearance, as in glaucoma, where it is said to be indicative of intra-ocular pressure; or an elevated appearance of its centre. The form of the vessels entering and leaving the centre, and the nature of the shadow, as shown by varying the light, will be the best means of ascertaining in these cases which state is present.

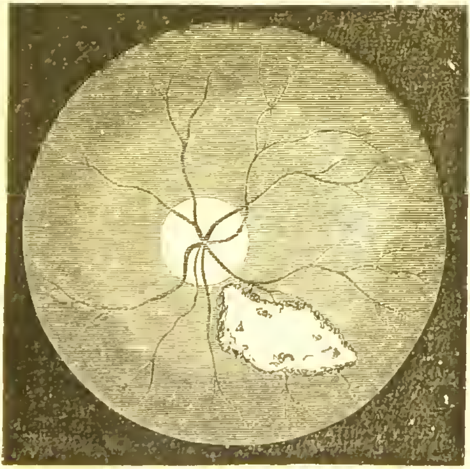

Fig. 4.

Atrophy of the disc is far from uncommon; it is often congenital; it is sometimes found in a squinting eye, and is often associated with excessive myopia. In cases of atrophy of the disc, the retina generally preserves its normal condition and vascularity. The optic disc does not always preserve its circular form; it is occasionally jagged in its outline, and pigmentary deposits are of frequent occurrence at its edge. From the choroidal degeneration which is often seen around its circumference, and from the white shining appearance of the sclerotic through the retina, the edge of the disc may be but indistinctly defined, and the crescentic patches of sclerotic may be confounded with the outline of the disc by the beginner; but to the practised eye the outline may always be distinguished.

The Retina.—Its transparency should be unimpaired, and its vascularity not greatly different from that of the healthy state. If the disc be hyperemic, it will naturally partake of the extra vascularity, but not always; for the disc may be injected with small vessels, while the retinal vessels are natural. Its vessels are subject to varicosities; and a certain indistinctness of outline is frequently observable in its overloaded veins. The arteries often show plastic exudations in their course, which have evidently been deposits during an inflammatory state (fig. 4). Extravasations of blood are occasionally seen from the rupture of one or more of the vessels (fig. 5); the gradual absorption of which may be watched. Serous effusions between the retina and choroid are attended always with more or less danger to sight, according to the locality and amount of the effused fluid. The retina may be seen, floating as it were, or lying in folds over the part, the bright-red choroid of course being hidden from sight. As the effusion is over or near the macula lutea, so is a more unfavourable prognosis to be feared. The retina is often anemic and even atrophied. M. Desmarres describes an affection which he calls œdema of the retina.[*] It is doubtless affected in secondary syphilis.

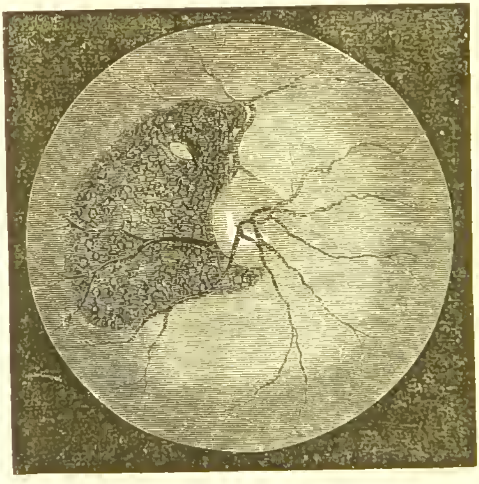

Fig. 5.

The Choroid, as may be anticipated from the vascularity of its structure, is most importantly involved in chronic changes in the deep-seated structures of the eye; and although we are by no means disposed to draw any strict line between the inflammation of the different tunics of the eye, as existing independently of each other; yet this structure shows changes so marked that the effects of choroiditis may be safely classed under one head. The principal affections of the choroid are hyperemia; when, instead of its usual somewhat orange-red colour, it becomes of a bright scarlet, the vessels are enlarged, and the pigmental striations are more or less indistinguishable. The absorption of the pigment from some parts causing white patches, and its redeposition in others forming the black deposits so often met with, are signs of the atrophy and disorganization of this important structure. These black deposits may take place at any part of the fundus, but they are most frequently met with around the edge of the optic disc. They are always situate between the choroid and retina.

Atrophy of the choroid when occupying the situation of the macula lutea, is always attended with considerable impairment and confusion of vision, and is of course irremediable. Plastic exudations from its surface, pushing the retina forwards, are sometimes seen. The appearance of an eye which has been the subject of chronic choroiditis is most striking. The black, white, yellowish, and red variations of colour have been described by Desmarres as the *Choroide tigrée*.

Effusions of blood from the surface of the choroid may take place, and probably many of the deposits on its surface have had this origin. Colloid degeneration has been described by Donders.*

An affection often met with in short-sighted persons, and involving both the choroid and sclerotic, must be noticed. The sclerotic is thinned at the posterior part of the eyeball, and bulges backward into a conical shape, carrying the choroid with it, and thus altering the antero-posterior diameter of the eye. It has been denominated sclero-choroiditis posterior. It generally takes place near the optic disc, and appears as a semi-lunar white patch, which more or less completely surrounds the optic disc. That the retina is perfect over this white patch is evident from the retinal vessels being continued over it in their normal size and distribution.

The Macula Lutea may be the seat of morbid deposits, hæmorrhages, and plastic exudations. Small vessels sometimes enter about these parts abnormally. All alterations from the healthy state in these structures are more or less detrimental to vision.

The vitreous humour is often the seat of hæmorrhage. Floating particles may exist in its substance, which is generally more fluid than in its normal state, or a greater or less degree of turbidity may interfere with its transparency, and envelop in a fog the parts posterior to it. Cholesterine scales may be seen floating about in it, and the cysticercus is occasionally seen in its substance. The vitreous humour should be thoroughly examined both with and without the lens. Floating particles and alterations in its anterior portion are best seen with the mirror alone.

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* Archiv für Ophthalmologie, 1855-6.

The use of the ophthalmoscope in diagnosing cataract in its incipient stage must be very evident. It is necessary that the pupil should be fully dilated with atropine. The frequency with which cataract commences in striæ at the edge of the lens, makes it impossible to state with any precision the condition of the whole structure with an undilated pupil. The striæ, which were undiscernible before the introduction of this instrument, are recognised with the greatest facility, appearing as black markings on the red field of the choroid. By fully dilating the pupil, also, we are able to examine well the capsule of the lens, which is often rendered spotted by deposits of uvea from the surface of the iris, and thus gives rise to muscæ and indistinctness of vision.

SECTION XIV.—DISEASES OF THE CHOROID; ASTHENOPIA; SYNCHYSIS; AND HYDROPHTHALMIA.

I. INFLAMMATION OF THE CHOROID, or CHOROIDITIS, is not a common disease; Dr. Mackenzie has generally met with it in strumous females.

Symptoms.—It commences with more or less intolerance of light, and dimness of vision, together with pain in the eye, eyebrow, and forehead, and lachrymation. The conjunctiva is not uniformly red, but one or more enlarged vessels are seen to proceed from the back of the eye, and to terminate in a vascular zone partially surrounding the cornea. The pupil is often displaced, and brought towards the affected side of the choroid. If it proceed, the sclerotic becomes thin and blue, showing the choroid through it—(*staphyloma scleroticæ*), and finally the cornea may become opaque, and the whole globe very much enlarged and protruding from the socket. The digestive organs are generally much deranged from the first, and hectic and emaciation come on when the eye becomes much distended and painful. See ophthalmoscopic appearances of diseased choroid, page 401.

Treatment.—If an acute case of the sort should occur in a strong constitution, local bleeding, purgatives, blisters to the nape of the neck, and warm or vapour baths, and mercury, may be necessary. But in cases of debility, great caution must be used in regard to depleting measures and mercury; and together with the latter some tonic should always be given. Counter-irritation is always of service. When the sclerotic becomes much distended, it may be punctured with a needle—the instrument being introduced for one-eighth of an inch towards the centre of the eye, so as not to wound the lens; this will cause temporary relief.

II. WEAKNESS OF SIGHT, OR ASTHENOPIA: MUSCÆ VOLITANTES.—Persons of delicate constitutions and sedentary habits, especially if they are in the habit of writing much, or otherwise exerting their eyes on minute objects, are liable to suffer from dimness of sight; uneasiness on exposure to a strong light; and the vision of floating black specks or streaks, which, from their resemblance to flies, have acquired the name of *muscæ volitantes*. In one form of the affection the patient is unable to continue for any length of time to look at minute or near objects; partly on account of the confusion and obscurity which overspread them, and partly from a sense of fatigue in the eyes. A short interval of repose is sufficient to recruit the eyes, so that the power of vision returns. The disease is apt to increase unless the particular employment that seems to produce it be abandoned, but it never ends in total destruction of sight, and must not be confounded with amaurosis. It is often improperly called *Choroiditis*. These symptoms evidently depend on weakness of organization, either original or produced by over-exertion; and the principal measures to be adopted are tonics, aperients, shower-bathing, and change of air, with perfect rest of the eyes, which afterwards should not be used too long at a time. It is almost always associated with hyperemia of the optic disc; see page 400. Weakness of sight, with intolerance of light, is very commonly an accompaniment of short sight; it may always be recognised by an uneasy bashful look about the patient's eyes, the lids of which are half-closed, and perpetually winking, and the brow contracted. Dr. Mackenzie has shown that the appearance of muscæ is caused either by globules of mucus on the surface of the cornea, or by minute particles floating within the eyeball.* This is confirmed by the ophthalmoscope, although in all cases the floating particles cannot be seen.

The surgeon should take care not to mistake the effects of mere fatigue of the eyes, such as aching, increased vascularity, intolerance of light, and muscæ, for inflammation; and not to treat such symptoms indiscriminately by depletion.

III. SYNCHYSIS (often attended with shrinking of the eyeball) is an unnatural fluidity of the vitreous humour, apparently from the breaking up and absorption of its containing tissue; it may or may not be also discoloured. The eye feels soft and flaccid, the iris is peculiarly tremulous, shaking backwards and forwards like a rag in a bottle of water, the retina becomes insensible, and the lens opaque. This affection is sometimes the result of wounds or concussions, and sometimes comes on without obvious cause. It is supposed to depend on slow inflammation. It is irremediable. It sometimes follows operations for cataract in which the needle has been too freely used. But although there is this great change of structure, vision may still be wonderfully perfect. For the ophthalmoscopic changes see page 401.

IV. DROPSY of the vitreous humour, or HYDROPHTHALMIA, probably depends on slow inflammation of the inner tissues of the eyes, generally the result of injury. It causes enlargement of the globe, with loss of sight. In some cases there is constant excruciating pain, only to be relieved by puncturing the sclerotic with a needle. In others, there is no pain; the disease advances a certain length, and then becomes stationary; and the only thing complained of, besides the loss of vision, is the deformity.

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* Mackenzie, Edin. Med. and Surg. Journ., No. 164.

SECTION XV.—RETINITIS.

The Retina must of necessity be more or less involved in any inflammatory process which affects the deeper structures of the eyeball; but sometimes it appears to be the original or sole seat of inflammation. That inflammation may be confined to the retina, without affecting the other textures of the globe, is rendered probable by the distribution of the arteria centralis retinæ, and its very slight vascular connexion with any other tissue.* Authors describe three forms: the acute, subacute, and chronic. 1. In the *acute* form the symptoms are—severe, deep-seated, and throbbing pain in the eye, extending to the temples and head; vision rapidly impaired, or even altogether lost; frequent sensations of flashes of light, with great fever and delirium. The pupil gradually closes, the iris loses its brilliancy, and the sclerotic is highly vascular and rose-red. If unrelieved, the whole globe may suppurate. 2. *Subacute.*—Dimness of sight, headache or giddiness, flushed countenance and fever; the pupil soon becoming motionless, and the iris turbid. 3. *Chronic.*—Gradually-increasing dimness of sight; visions of black spots or flashes of light; irritability of the eye and intolerance of light; tenderness of the eyeball, and of the parts around; but the patient, though he may shade the eye, does not always shut it. These affections are distinguished by the circumstance that dimness of sight and intolerance of light occur before redness or any external sign of inflammation. But the practitioner must carefully discern between these symptoms and the intolerance of light, or photophobia, which occurs in *Strumous Ophthalmia*, as the treatment for the two complaints should be diametrically opposite. The age of the patient, and the fact that in Strumous Ophthalmia the sufferer has periods of remission, and can usually open the eyes towards evening, will sufficiently mark the difference; besides, in acute *Retinitis*, there is deep-seated pain felt at all times, while in Strumous Ophthalmia the pain is very little felt, so long as light is completely excluded. See retinal changes, page 400.

Causes.—Exposure to vivid light, flashes of lightning, strong fires, the reflection of the sun from snow, and the like; or habitual exertion of the eye on minute objects, together with neglect of exercise, confinement of the bowels, and over-indulgence in food and spirituous liquors, or else with debility, and want of nourishment.

Prognosis.—If, in the acute or subacute form, vision is not much impaired, nor the iris altered, nor the pupil much contracted, the prognosis may be favourable.

Treatment.—For the acute, local bleeding, purgatives, mercury administered so as gently to affect the mouth; for the chronic form, a gentle course of mercury, and the antiphlogistic treatment generally, according to the urgency of the symptoms, and the strength of the patient. The eyes should not be closely covered, but the patient should be kept in a darkened apartment, observing at the same time that it is thoroughly ventilated. So soon as the symptoms abate, bark and change of air will be found of great service.

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* Taylor, Med. Times and Gaz., June 5th, 1852.

SECTION XVI.—AMAUROSIS.

Definition.—Imperfection of vision, depending on some change in the retina, optic nerve, or brain.

Symptoms.—1. Of course the first and most prominent symptom is impairment of vision; the mode and degree of which are, however, subject to very great variety. Sometimes the sight becomes suddenly dim, and is soon extinguished altogether; more frequently it becomes impaired by slow degrees; and at first it is so only at intervals; after the eyes have been fatigued, for instance, or when the spirits are low, or the stomach disordered. Sometimes it commences as indistinct vision, or *amblyopia;* or as *diplopia,* objects appearing double; or, as *hemiopia,* one-half only of the objects looked at being seen; or objects may appear crooked, disfigured, or discoloured; or they may be seen covered with patches; or the affection may commence as near-sightedness or far-sightedness. The patient finds himself unable to estimate distances, and misses his aim when trying to snuff a candle, or pour wine into a glass. The flame of a candle generally appears split, lengthened, or broken into an iridescent halo.

2. *Ocular spectra,* sometimes in the form of floating black spots (*muscæ volitantes*), sometimes as flashes of light, or as a coloured cloud or network.*

3. Sometimes incipient amaurosis is attended with great intolerance of light—sometimes, on the contrary, with a constant *thirst for light,* or feeling as if objects were not illuminated enough.

4. The patient walks with a peculiar uncertain gait, and his eyes have a vacant stare; the eyelids move imperfectly and seldom—the pupil is generally dilated (unless it be an incipient case, attended with intolerance of light); the iris moves sluggishly, and in confirmed cases is totally motionless. But if one eye be sound, and be exposed to light during the examination, the pupillary movements may not be lost.

The ophthalmoscope enables us to state with tolerable accuracy when the cause is strictly cerebral; for if with impairment or loss of sight, the eye looks perfectly healthy, we may without much doubt say that the disease is within the skull.

Whenever the state of the eye will admit it, the opthalmoscope should be used not only for diagnosis, but to ascertain the arrest or the progress of the affection.

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* The student will do well to read Milton's account of his own blindness, as given in Dr. Johnson's Lives of the Poets, and in Travers's Treatise on the Eye.

Diagnosis.—Amaurosis may be distinguished from cataract by noticing, 1. That, in cataract, an opaque body can be seen behind the pupil, and that the impairment of vision is, for the most part, in proportion to the extent of that opacity; whereas, in pure amaurosis, *in young persons*, the pupil shows its natural colour. A greenish colour of the pupil has sometimes been considered a diagnostic mark of amaurosis. On this point, says Mr. Walton, "the paleness or light yellowness, that exists behind the pupil after middle life, is often thought to be symptomatic of amaurosis; it is, however, but the effect of the coloration of the lens, and is seen with or without defective nervous power: young persons with amaurosis never exhibit this appearance. It is this coloration that produces so much difficulty in diagnosis in adults;" and unless the symptoms be taken into account, it is often impossible, from the mere look of the pupil, to determine between the earliest stages of the two diseases. 2. That, in cataract (with the exception of the radiating variety), vision is simply *clouded*, and that a lighted candle appears as if enveloped in a mist; whereas, in amaurosis, objects are seen *dis*-coloured or perverted in shape; and that a lighted candle seems split, or lengthened, or iridescent; and that *muscæ volitantes*, and flashes of fire when the eyes are shut, are not present in pure cataract. 3. That, in cataract, vision is better in a dull light, whereas it is generally the reverse in amaurosis. 4. That a patient with cataract is always able to discern light from darkness, and that he looks about him, and moves his eyes, as though conscious that vision still exists, although he may be unable to discern particular objects; whereas, in confirmed amaurosis, there is the fixed vacant stare of utter darkness, and the eyeball is protruded and motionless. 5. That in pure amaurosis in young persons, before the lens has begun to change colour, the three images of a candle are as distinct as in the healthy eye, which is not the case in cataract. In the aged, says Mr. Walton, the catoptric test may enable the surgeon to compare the existing degree of opacity, with the amount of imperfection of vision; for instance, he may judge the case to be amaurotic if the degree of blindness is great, out of all proportion to the degree of opacity of the lens; but the ophthalmoscope will be found the greatest aid to diagnosis.

Prognosis.—This is generally unfavourable—unless the disease depends on some palpable cause which admits of removal, and unless the remedial measures employed very soon produce good effects.

Varieties.—Amaurosis has been divided into the *functional* and *organic*; the former depending on some sympathetic or other disorder which does not primarily affect the structure of the nervous apparatus of the eye—the latter on organic disease.

Causes.—The usual causes of amaurosis are circumstances that overstimulate and exhaust the retina; such as long-continued exertion of the eye on minute objects; or exposure to glaring light, especially if combined with heat—and these exciting causes are particularly aided by intemperance, stooping, too much sleep, and any other circumstances capable of producing determination of blood to the head. Amaurosis may also be a consequence of anæmia, and want of power; of organic change, inflammation, concussion, compression from extravasated blood, fractured bone, morbid effusions, tumours, or aneurisms—whether affecting the brain, optic nerves, or eye.

Treatment.—The indications in every case are, 1. To rectify any palpable disorder—inflammation or plethora by depletion; debility by tonics; bad habits, if possible, by moral means. 2. To neutralize determination of blood to the eye or head by counter-irritation. 3. To stimulate and restore the excitability of the retina. For practical purposes it will be convenient to classify the disease under the five following heads, viz., 1. Inflammatory; 2. Atonic; 3. Sympathetic cases; 4. Those produced by poisons; and 5. By organic disease.

Inflammatory.—If amaurosis be attended with any of the symptoms of retinitis, iritis, or choroiditis, that have been before enumerated;

Bleeding or cupping from the temple or mastoid process may be performed at intervals. The bowels should be well cleared, the diet should be devoid of alcohol, and all employment of the affected organ, and all violent bodily exertion, should be desisted from. Mercury should be administered so as to bring the system gently under its influence. (F. 64.) Counter-irritants of all sorts are beneficial; blisters, or the tartar-emetic ointment applied behind the ears or to the nape of the neck; immersion of the feet in hot water and mustard; or an issue in the arms in chronic cases. In cases where gout is evident, colchicum; where rheumatism, iodide of potassium; where scrofula, cod-liver oil and iodide of iron may be beneficial.

2. *Atonic* amaurosis may come on at the close of any exhausting illness, or may be produced by great loss of blood, menorrhagia, immoderate suckling, leucorrhœa, excessive venery, or other debilitating circumstances. It has been frequently noticed after diphtheria.* It may be distinguished by its being attended with debility, pallid lips, weak pulse, dilated pupils, and an anæmic state of the retina; and the patient generally sees best after a meal or a few glasses of wine, and in a strong light. The *treatment* consists, first, in suppressing any habitual discharge, or other source of exhaustion. Secondly, in strengthening the system by change of air, tonics, quinine, steel and zinc, and especially by good living. At the same time the abdominal secretions should be well regulated by aperients (such as aloes and rhubarb), that act copiously, but not drastically; and the cutaneous and general circulation be promoted by exercise and bathing, especially the shower-bath. F. 9, 13, 21, 190. It is in this form, if in any, that local stimulants are applicable—such as exposing the eye to the vapour of æther or sal volatile (a teaspoonful of either being held in the hand); stimulating snuff (F. 184), cataplasms of capsicum to the temples; friction of the forehead with cajeput or croton-oil, or with an alcoholic solution of veratria.

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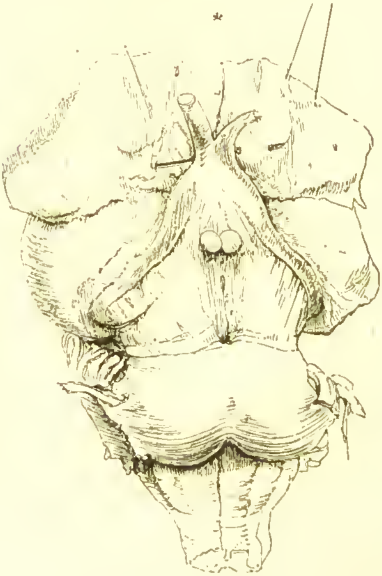
* See Med. Times, 1859, vol. i., p. 659.

3. *Sympathetic.*—(*a.*) Amaurosis not unfrequently supervenes on an attack of jaundice. If there be evidence of congestion in the head, as there frequently will be, blood should be taken by cupping, whilst the abdominal disorder should be removed by appropriate measures.

(*b.*) If there be headache, vertigo, foul tongue, and other evidence of abdominal disorder, an emetic, blue pill or hyd. c. cretâ, in small doses every night; and purgatives, till the secretions are set to rights, followed by tonics and counter-irritants, are the requisite measures. In similar cases, some foreign authors recommend the use of Schmucker's or Richter's *resolvent pills*, F. 185. Turpentine, or the *kousso*, or the oil of male fern should be given if there be signs of tape-worm.

(*c.*) Amaurosis sometimes arises from irritation of the fifth pair of nerves. If it follows a wound on the forehead, the latter should be dilated, or if it have healed, the cicatrix should be cut out. Tumours of all sorts near the eye, and carious teeth should be removed.

4. *From Poisons.*—Amaurosis is liable to be induced by certain poisons, such as lead and belladonna. If the amaurosis persist after the ordinary effects of the poison have been got rid of by the usual measures, the cold shower-bath, counter irritation, electricity, and iodide of potassium, are the remedies most likely to be of service.



5. *Organic.*—These cases are the most hopeless. If the disease has followed an injury of the head, or fit of apoplexy, or syphilis, or if there be reason to suspect a tumour in the brain, or in the course of the optic nerve,—a moderate course of mercury, or of iodide of potassium with alkalis and sarsaparilla, and with counter-irritants, should be tried, and sometimes may effect a cure. Amaurosis arising from a tumour within the brain will usually be accompanied by symptoms that will sufficiently point out the hopeless nature of the disease. There is an interesting case of this kind related by Mr. Browne of Belfast, in the "Dublin Journal of Medical Science," for May 1849, in which there was increasing amaurosis, with complete

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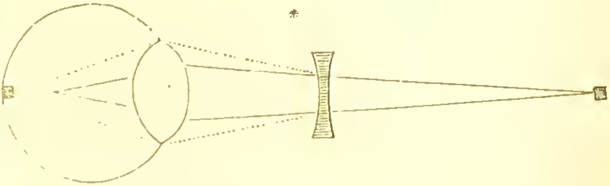
* This cut exhibits atrophy of the left optic nerve and right tractus opticus consequent on amaurosis. From the Middlesex Hospital Museum.

paralysis of the motores oculi nerves: after death a tumour, nearly three drachms in weight, was found in one of the crura cerebri. For other cases of amaurosis arising from organic disease, especially if there be fixed pain in the head, palsy, or epilepsy, or idiocy, the best thing that the surgeon can do will be to prevent congestion in the head by occasional depletion, and counter-irritation; to maintain the secretions of the liver and bowels; to keep up the strength by a nutritious but not stimulating diet, and to guard the patient from every excess or exertion, mental or bodily, that is capable of accelerating the cerebral circulation.

SECTION XVII.—SHORT AND LONG SIGHT.

1.—Short Sight, or Myopia.—This affection may depend either on an increase in the refractive power of the eye, or else on an elongation of its axis, so that in either case the rays of light are brought to a focus before they reach the retina. The cornea is often exceedingly convex, and the secretion of aqueous humour abundant; and the crystalline lens is also too convex, all of which circumstances would cause the refractive power of the eye to be increased. The ophthalmoscope detects certain changes in the choroid and sclerotica close to the optic disc (see p. 399). It is caused by too close attention to study, and by habits of looking at minute objects, as in reading, learning music, and the like; by which the ciliary muscle is brought constantly into play in the adaptation of vision, and thus, probably, the curves, both of the cornea and crystalline lens become altered, and their surfaces become sections of smaller spheres than normal; hence, the increase in the refractive powers of the eye. It is often an indication of delicacy of constitution. It is a popular error to imagine that the sight improves as the individual grows older.



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Treatment.—The eyes should be exercised and accustomed to look at distant objects. When children display any tendency to short sight, their studies should be abridged, and they should have plenty of exercise in the open air. Shooting, archery, cricket, and field sports in general, are highly beneficial. It is worth while also to try a plan of treatment invented by Berthold, and consisting in the use of an instrument which has received the sesquipedalian title of *myopodiorthoticon*. This is really nothing more than a support for the chin, to prevent the patient stooping forwards, whilst he reads from a book with large print. And the book is every day to be placed at a slightly-greater distance from the eyes, till the patient has acquired the faculty of reading at the ordinary focal distance—that is to say, at about fifteen inches. The glasses which are adapted for shortness of sight are concave; since they tend to disperse the rays of light, and prevent their coming to a focus so soon. They should not on any account be resorted to, however, if the patient can go on pretty comfortably without them; or, at all events, should only be worn when required to prevent him from stooping awkwardly whilst reading or playing music. But if the myopia is very decided, or if the eyes feel fatigued after any ordinary use of them, it will be better to wear the glasses continually. Spectacles should always be used in preference to a single glass. The patient should choose a pair that enables him to see objects within forty feet as distinctly as other people—the names on the corners of the street, for instance; but should not have them so concave as to make objects appear dazzling, or smaller than usual.

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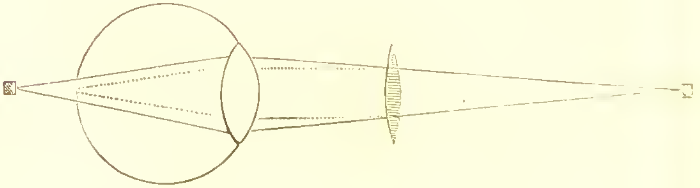
[*] The above cut is intended to explain the nature of myopia, and the effects of concave glasses; which disperse the rays and prevent their coming to a focus before they reach the retina. That on p. 410 is intended to show the reverse state of things in presbyopia.

II. PRESBYOPIA, or long-sightedness, depends apparently on a diminished quantity and density of the humours of the eyeball, through which it becomes flatter, and its refractive powers are diminished. It needs scarcely be said that it is one of the earliest signs of impaired nutrition in old age. The patient's sight must be remedied by *convex glasses*; and whilst in myopia the patient should abstain from the use of glasses if at all possible, in presbyopia, on the contrary, glasses should be used immediately that the patient perceives that he cannot read at the usual distance without fatigue to the eye; taking care that the lenses chosen are of the lowest power, that will assist vision and restore the faculty of reading at the distance of from twelve to sixteen inches. The sight should be spared by candle-light as much as possible. The glasses should cause minute objects near the eye to appear bright



and distinct, but not larger than natural. If they do, they are too convex.*

SECTION XVIII.—SQUINTING.

SQUINTING, or STRABISMUS, may be defined to be a want of parallelism in the position and motion of the eyeballs.

The essential *cause* of the affection is very obscure. Probably our knowledge is best expressed by the statement that for the most part there is some weakness of sight, or some want of adjustment in the visual axis of one eye, in consequence of which it is involuntarily turned aside in order to avoid the double or distorted vision that would result from looking at objects with two eyes of different powers.

The ordinary form of squint in young persons is the *convergent*, or that in which the eye is turned inwards; the *divergent*, or that in which the eye is turned outwards, is more rare, and is chiefly met with in elderly persons, for the most part from partial paralysis of the internal rectus. It occasionally happens that both eyes squint: but it must be remarked that the appearance of this is more frequent than the reality. A squinting patient may *change eyes* as it were: that is to say, he habitually uses one eye only; and although he habitually uses the stronger eye, and squints with the weaker, yet, at times, and especially if excited, he will look straight with the squinting eye, and squint with the sound one. Hence, there is often some difficulty in deciding at first which eye is the really squinting one; a point that must be determined by quietly watching the patient, and finding out which eye squints habitually when at rest. Occasionally, it is true, however, both eyes converge at the same time. When one eye is distorted and *fixed*, the affection is called *luscitas*.

CAUSES.—1. Squinting may be congenital. 2. It may be induced by bad habits; such as the imitation of parents, nurses, or schoolfellows, if they happen to squint; or by constantly looking at spots and pimples on the nose; or it may follow affections (such as hordeolum) which render motion of the eye painful, and during which the patient turns the eye inwards and keeps it motionless. 3. It may be caused by using one eye constantly to the neglect of the other. It has been known to occur after one eye has been for a long time shaded, in consequence of an inflammatory attack; which shows the expediency of always covering both eyes when a shade is necessary. 4. If there happens to be an opacity on the cornea of one eye, and that eye is the better one, the patient will sometimes continue to use it for ordinary vision, but for that purpose is obliged to distort it so as to remove the corneal opacity from the visual axis. 5. Squinting, like almost every other conceivable consequence of defect of nervous influence, is sometimes a relique of fevers and the exanthemata. 6. It may be induced by irritation or disorder of the stomach and bowels, teething, worms, constipation, and so forth; it may, moreover, be caused by fright or violent fits of passion; and in some children it always appears when the health is out of order, and disappears when it is restored. Lastly, it may be caused by some disorder of the circulation in the brain. Thus, it is pretty frequently the precursor of acute hydrocephalus or convulsions in children; and when it is associated with dropping of one or both eyelids, and with unusual sleepiness, or torpor of the intellect, or faltering in the gait, some mischief within the head may fairly be anticipated.

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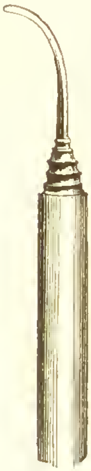
* An elderly gentleman, who had been some time presbyopic, met with a violent fall and contusion of the eyes, which doubtless produced an increased secretion of aqueous humour, and restored his power of seeing at the ordinary focal distance. Presbyopia occurring in young persons generally arises from intestinal irritation, and may be a precursor of amaurosis.

Treatment.—If the affection be recent, that is to say, of not more than a few weeks' duration, it may perhaps be removed or mitigated by judicious medical treatment, especially by purgatives, antacids, and tonics (F. 37), and by abstinence from study, and plenty of exercise in the open fields. Various devices have been proposed for strengthening and exercising the weak eye, by shutting up the sound one, wearing goggles, placing black patches on the nose, and so forth. But if the squint is of long standing and is habitual, and, above all, if there is any disparity in vision, very little, if any good can be done unless the internal rectus muscle is divided. This is easily performed in the following manner:—The patient, if an adult, and manageable, sits in a low chair; if an unruly child, he should be quieted by chloroform and laid on a table. The instruments required are a pair of blunt-pointed scissors, a smooth slightly-curved blunt hook, and a wire speculum or retractor. Then the lids of the squinting eye being held apart by a spring retractor wire speculum, the surgeon, desiring the patient to look outwards, pinches up a fold of the conjunctiva with the forceps opposite the lower edge of the internal rectus, a little behind its insertion into the sclerotic. This is snipped with the point of the scissors; and next the subconjunctival cellular tissue is snipped through, so as to expose the glistening surface of the sclerotic. It must be remarked that this subconjunctival tissue is sometimes so thick as to be mistaken for the muscle. The aperture thus made should be quite small, only just sufficient fairly to introduce the blunt hook, which should next be thrust upwards between the muscle and the sclerotic. Lastly, the tendinous insertion of the muscle, and the conjunctiva which covers it, are to be divided with the scissors. "In order," says Mr. Walton, "to secure effectually every portion of the tendinous expansion of the muscle, the hook should be passed a little below the level of the pupil in its ordinary state of dilatation, directed backwards to a sufficient distance, swept along the side of the globe, and its point made to project just a little above the level of



the pupil." It should be the desire of the operator to cut no more of the conjunctiva than is required to insure the complete division of the muscle, and of this latter there cannot be the same certainty except the membrane be cut at the spot directed. Mr. Walton has lately brought the edges of the conjunctival wound together by one or two fine sutures passed through the very margin of the edges. The sutures do not cause the least irritation. They drop out about the third or fourth day. The advantages of this plan are that it prevents the dropping of the caruncle, the falling in of which to a great degree causes the vacancy sometimes so marked after the ordinary operation; that rapid union is effected instead of the slow granulating of an open wound; and that there rarely appear any of those fungous growths that are otherwise common. When the operation is complete, the surgeon will find that the patient can move the eye more freely than before in all other directions, but that he *cannot move it directly inwards.*

In cases in which, after division of one of the recti, the eye has not returned to its central position, Mr. Wilde has drawn and retained it in its proper place by means of a ligature passed through the sclerotic attachment of the divided rectus, and fixed by sticking-plaster to the nose or temple, and allowed to remain two or three days.

The external rectus may be divided by a similar operation, for the divergent squint; and in some instances it has been done for the relief of divergent, which has followed the cure of the convergent squint. No operation should be attempted when the squint depends on opacity of the cornea, or on cicatrices, tumours, or other mechanical causes; and it should always be ascertained, before dividing any muscle, that its antagonist is not paralyzed.

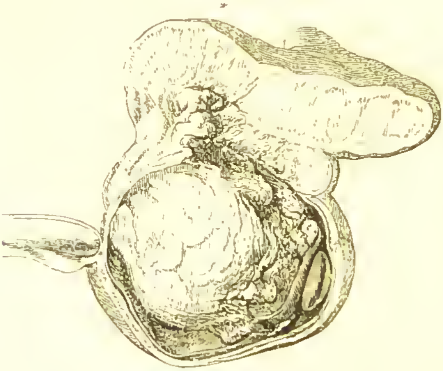
SECTION XIX.—TUMOURS IN THE ORBIT, CANCER OF THE EYE, ETC.

I.—PROTRUSION OF THE EYEBALL.—We have already spoken of tumours in the eyelids; of tumours on the surface of the conjunctiva; and of tumours resulting from disease of the lachrymal gland. We have yet to allude to the fact that tumours, fatty, osseous, encysted, and *solid* or *sarcomatous*, as they were formerly called (which have not yet been sufficiently examined), may occur within the orbit, causing, as their general symptoms, protrusion, with more or less displacement of the eyeball, and projection at the seat of the tumour. The danger of tumours in this situation is twofold: destruction of the eye from continued pressure; and protrusion through the roof of the orbit into the cavity of the skull, with compression of the brain; which should be averted by extirpation so soon as the morbid growth is of a size to threaten mischief. Sometimes it is fair practice to puncture, or still better to lay open, an encysted tumour by a free incision.

But it is not every protrusion of the eyeball that is caused by tumours. For instance,—1. An excessively protruded and goggled state of the eyeball sometimes occurs in connexion with *anæmia*, general debility, and enlargement of the thyroid gland: the mechanism of this is ill understood; the best remedy is steel. 2. *Suppuration*, or inflammatory effusion, may take place within the orbit. This may occur either internal or external to the *ocular sheath* of Bonnet and O'Ferrall; a layer of fascia, immediately surrounding the eye, extending from the posterior margin of each palpebra to the apex of the orbit, and perforated by the ocular muscles. Effusion may take place in the orbit either internal or external to this sheath. If internal to it, there will be a chemosed-like projection of the conjunctiva at its angle of reflection from the eyeball to the palpebra. If intense pain, unrelieved by treatment, with shivering, indicates the presence of pus, a puncture should be cautiously made within the palpebræ by the side of the eyeball.

II. CANCER may affect the eye or other contents of the orbit, particularly during the earlier periods of life. It may occur in any form, or affect any structure; for the common opinion that it usually first attacks the optic nerve or retina, is, according to Lebert and Paget, not well founded. The scirrhous, or hard variety, is very rare: most ocular cancers being of the soft or else of the melanotic variety.

1. *Cancer within the Orbit.*—Weight, perhaps pain in the orbit, and displacement of the eye, with dimness of vision, are the earliest symptoms; which are followed by the protrusion of a tumour. Engorgement of the surrounding blood-vessels, destruction of the eyeball, adhesion of the palpebræ, protrusion of a large tumour, bleeding, sloughing, or exuding thin offensive discharge, cancerous deposits in the cranial cavity, in the cervical glands, and in distant organs, follow in succession.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2. *Cancer within the Eye.*—After some amount of vascularity, and of other signs of derangement of the eye—or, perhaps, after it has been discovered (if the patient is a child) that the sight of the eye is lost—an examination is made, and a patch of metallic lustre, of a grayish,

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* From a drawing of a preparation in King's College Museum, with which the author was favoured by Mr. Partridge.

reddish, or yellowish-white colour is discovered deep in the eye, behind the crystalline lens. The iris is tarnished, and sluggish. As the tumour grows, and comes nearer to the cornea, it can usually be clearly distinguished as being lobulated, and covered with blood-vessels. In time, it fills the eye, and presses the iris against the surface of the cornea, the eyeball is tense and painful, and the surrounding parts very vascular. Finally, it bursts through the cornea or sclerotica ; a huge fungus protrudes, and the disease arrives at a fatal termination through the stages we have just indicated.

The *diagnosis* of intra-ocular cancer is important, because deposits of lymph or tuberculous matter may occur in the depth of the eye, and present all the outward and visible signs of a cancerous growth. In fact, the diagnosis of such a growth is considered by the best authorities to be impossible, until time reveals whether the eye is to burst before a protruding fungus, and the health to exhibit the decay consequent on the extension of cancer ; or whether, on the other hand, the eyeball is, 1, to remain blind but unaltered ; or, 2, to be the seat of scrofulous suppuration, or, 3, to waste and become atrophied ; one of which three contingencies usually results when this peculiar appearance is the result of injury or of slow inflammation in a scrofulous subject.

3. *Melanotic* cancer is common in this situation, Lebert having found it in $\frac{10}{23}$ cases: it may primarily affect the orbit, conjunctiva, or optic nerve, but, curiously enough, has not been found primarily in the iris or choroid, where it might naturally have been expected. Melanotic cancer pursues the course of soft cancer, but perhaps more rapidly. Protrusion of a tumour exuding a darkish sepia-like fluid, and a great multiplicity of organs affected with secondary deposits, are leading features.

There is at present considerable confusion existing in the use of the term *melanosis*, which is often used as if synonymous with cancer. But, as we have before observed, *melanotic cancer* is true soft cancer, combined and infiltrated with large quantities of black pigment. On the other hand, collections of black pigment may exist in natural and morbid structures without cancer. Patches of black pigment may be found, and may remain for years on the conjunctiva unaltered.

4. Cancer may commence in the *conjunctiva* in the form of small vascular tumours, which soon display the characters of soft cancer, or the dusky hue of melanosis. Scirrhus is treated of by authors, but is extremely rare. Cancer, likewise, may affect the caruncle, constituting the disease formerly called *encanthis*.

5. It may also affect the lids ; but here we must note the not unfrequent occurrence in aged persons, first of epithelioma on the lower lid ; commencing as a wart, lasting an indefinite time, but, if irritated, terminating in incurable ulceration ; yet altogether different from cancer in structure, and giving much more hope for extirpation. Secondly, of a glassy ulcer of the *lupus* kind.

Treatment.—The treatment of cancer of the eye comprises two classes of measures: 1, the various palliatives mentioned at p. 118 ;

2, extirpation, which latter is also to be regarded as palliative, since, in cancer of the eye, the disease (if not already developed within the cranium) is sure to appear there or elsewhere. It seems to be the general opinion of surgeons, that it is useless to extirpate soft cancer of the eyeball, especially in children; but that, in melanotic cancers, the extirpation of the contents of the orbit affords a greater chance of prolonging life; and that all superficial cancerous tumours of the conjunctiva should be freely extirpated as soon as possible.

III. EXTIRPATION OF THE EYE is required occasionally, not only for cancer but for disorganizing suppuration, and other diseases which may render a sightless eyeball a source of great irritation. When the eyeball alone is to be extirpated, for a non-cancerous growth, Bonnet's operation may be performed, which consists in dividing the conjunctiva, cutting through the insertion of the recti and oblique muscles, drawing the eyeball forwards, and severing the optic nerve. Sometimes it is necessary to slit up the external commissure of the lids; but in most cases the entire contents of the orbit require to be removed.

During this operation, Mr. H. Walton places the patient on his side, to allow the blood to run away more easily. The first step is to slit up the external commissure of the lids, with the conjunctiva and adjoining skin, to a sufficient extent. The eyelids then being held apart with retractors or spatulas, the operator takes hold of the eyeball with his fingers, or with hooked forceps, cuts through the conjunctiva above and below; cuts through the levator palpebræ, dissects away the attachments of the superior and inferior oblique, and all vascular and cellular attachments to the walls of the orbit; then drawing the globe strongly inwards, cuts through the optic nerve, vessels, and muscles at the apex of the orbit, by means of a straight scalpel passed along the outer wall of that cavity. Mr. Walton does not find that crooked instruments have any advantages for this last purpose over straight ones. The lachrymal gland should be taken away; bleeding be arrested by syringing with cold water; if troublesome, by a solution of alum on lint. The lids must then be closed, and a compress dipped in cold water be applied over the face.

IV. ARTIFICIAL EYES consist of a thin scale of enamel coloured to imitate the natural eye. They are adapted for cases in which the globe is sightless and shrunken, after the removal of staphyloma, for instance. "Besides the removal of deformity," says Mr. Walton, "the presence of the false eye may be of essential service in keeping the lids in their natural position; and preventing the cilia from irritating the shrunken globe; in placing the puncta in a more natural position for conveying away the tears; in acting as a defence against intruding bodies, which are apt to be retained within the lids and to produce irritation, and as a means of keeping the cavity free from collections of lachrymal secretions."

After staphyloma or any other disease which has rendered the eyeball shrunken and sightless, if the patient objects to the trouble and expense of an artificial eye, it may be convenient to divide the levator palpebræ, in order that the lids may remain permanently closed. This may be effected by making a transverse incision in the upper eyelid just below the orbit, and seizing the belly of the muscle as far back as possible. Then a piece should be snipped out of it with scissors.[*]

CHAPTER XIII.

DISEASES AND INJURIES OF THE EAR.

SECTION I.—EXAMINATION OF THE EAR.

Examination of the Meatus.—Every surgeon ought to accustom himself to examine the external passage of the ear, and to become familiar with its appearances, both in health and in disease. We may premise that this canal is about an inch long; that its course is forwards and inwards, but that it presents a slight curve with the convexity upwards, and is narrowest about its middle. It may be said to have three divisions, which differ from one another in structure and appearance. In the first or outermost part of the tube, the passage is "formed almost entirely of pure fibro-cartilage covered with its perichondrium," and lined by the same fine dermal structure that invests the auricle.[†] "Here the skin is studded over with fine white hairs pointing inwards, and also with numerous sebaceous glands or follicles. It is here also more loosely connected to the cartilage than at any other part of the tube; and this accounts for the fact that small circumscribed abscesses occur in this part of the canal more frequently than in any other. The next portion of the tube may be called the *glandular* division, because in it are seated the ceruminous glands that secrete the ear-wax; this is about three-eighths of an inch long, and is the narrowest portion of the tube." Its walls have less of cartilage, and more of dense fibrous membrane in their composition, and its dermal lining is finer. When in a healthy state it is generally lined with wax, which forms a ring, coating this part of the meatus. The third and last portion of the passage is slightly dilated, and contained principally within the bony part of the meatus. It can only be seen satisfactorily by means of a speculum, of which instrument several sorts are sold, and some of them intended to dilate the ear. But since it is only the outer

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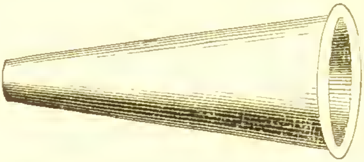
[*] Vide Lectures by Professor Green, in Sir A. Cooper's Lectures; Copland Dict., art., Eye, Amaurosis, &c.; Middlemore on Diseases of the Eye; Guthrie on the Operative Surgery of the Eye; Morgan on the Eye by France, Lond., 1848; Tyrrell on the Eye, Lond., 1840; Mackenzie on Diseases of the Eye, 3rd edit., Lond., 1840; Hull on the Morbid Eye, Lond., 1840. See also Mackmurdo's Lectures on Diseases of the Eye, Lancet, 1850; Bowman's Lectures on Operations on the Eye, Lond., 1849; Haynes Walton's Lectures in the Medical Times, 1850; and Operative Ophthalmic Surgery, Lond., 1853; G. Critchett, on Excision of Iris; Ophthalmic Hospital Reports, 1857; Alfred Poland on Protrusion of Eyeball, *ib.*; Jabez Hogg on the Ophthalmoscope, 1858.

[†] The quotations are from the Practical Observations on Aural Surgery, by W. R. Wilde, Lond., 1853.



extremity of the meatus that can be dilated, these dilators are of no great use, and the most convenient instrument will probably be found to be a simple conical silver tube, of the size and shape depicted in the above cut, and intended solely to transmit *light.*

For the examination, it is advisable to have a good stream of direct sunshine; but if this cannot be had, the best substitute is a lamp or candle with a reflector.* The patient, according to his height, should sit, kneel, or stand sideways before the surgeon; who should take the auricle with one hand and gently draw it outwards and backwards, whilst with the other he inserts the speculum as far as it will go without pain. Then, by placing the patient's head at the proper angle, and by gently moving the large end of the speculum from side to side, a stream of light may be made to play on the innermost portion of the meatus, and on the membrana tympani. But the operator must take care not to put his own head in the light.

When the innermost portion of the meatus is thus examined, its lining exhibits, if healthy, a "fine, smooth, dry, pearly-white, shining appearance," and in a perfectly healthy state it is not coated with wax. The *membrana tympani* also is seen closing the passage obliquely; grayish-white, dry, and semi-transparent. "Within it is seen the handle of the malleus, proceeding from above downwards, and slightly forwards. This bone, which runs about half-way across the membrane, divides it into an anterior superior and posterior inferior portion, the former of which is flat or slightly concave, whilst that part "which is below and behind the malleus is, in a perfectly healthy *living* human ear, convex towards the external aperture. This lower portion is also more glistening in appearance than the upper or anterior part, and when viewed through the speculum, a bright spot of light shines upon its most convex portion, which is a little below and behind the point of the malleus." Under inflammation, this innermost division of the meatus becomes thickened, highly vascular, and villous or granular, like the granular conjunctiva, and secretes a purulent matter.

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* One made by Fergusson, of Smithfield, is very cheap and portable, and answers all purposes for the examination of any internal organ with a speculum. The ophthalmoscope would do still better.

SECTION II.—AFFECTIONS OF THE EXTERNAL EAR.

I. FOREIGN SUBSTANCES IN THE EAR.—Children not unfrequently poke bits of slate pencil, peas, glass beads, &c., into the passage of the ear, which, if allowed to remain, would give rise to violent inflammation and deafness; any such body should, therefore, be removed as quickly and as gently as possible, either by syringing the ear with warm water, or by means of a small forceps, curette, or scoop. If it cannot be removed by gentle means, it should be allowed to remain quietly, says Mr. Vincent, when probably it will become coated with wax, and the passage will enlarge by interstitial absorption, so that it may be removed without trouble. The surgeon should always make certain, by an examination with the speculum, that there is a foreign body present, before he begins poking instruments into the ear, remembering that a late eminent hospital surgeon is said to have dragged out the stapes whilst fishing for a small nail, which was not in the ear after all.

II. ACCUMULATION OF WAX, mixed with hair and cuticle, in the external meatus, is a common cause of deafness. Syringing the ear gently with warm water is an effectual mode of dislodging it. Syringing, however, is not always to be done with impunity, for if the membrana tympani be inflamed or dry, and the passage devoid of wax, great irritation may be induced by a jet of water, especially if it be forcibly injected. The condition of the membrane, therefore, ought to be previously ascertained, by an examination with the speculum; avoiding the too common practice of using a probe without first ascertaining the cause of deafness. A little cotton should be inserted into the concha after syringing. The water used should be quite warm enough to be comfortable, and the syringe should hold one or two ounces; its piston should work easily and accurately, so that no air-bubbles may be squirted in; the patient should be carefully protected by towels; and the water injected should be *clean*, and in a separate basin; the dirty water that has been already used should not be injected over again.*

A large metal syringe is the best instrument for washing out accumulations of wax; a small elastic bottle is the best for applying lotions or injections; and one of the small elastic suction-bottles with a tube, commonly known as *Margett's*, is a capital thing to enable patients themselves to pass a gentle stream of warm water into the ear, as a fomentation, in any case of pain or inflammation. This is a most soothing process. Margett's syringe is also useful for *douching* the eye.

III. OTORRHŒA.—This term signifies a purulent or muco-purulent discharge from the external auditory passage. Its most frequent cause is—

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* A simple kind of water-spout is made by Coxeter, which may be applied to the ear, and entirely prevent the patient from being wetted.

Catarrhal Inflammation of the lining membrane of the meatus, which is excited by cold or stomach disorder, and is most frequent in children whilst cutting their teeth; it may accompany strumous ophthalmia, porrigo, and other eruptions; or it may be a sequel of either of the exanthemata, or, in fact, of any weakening illness. The little patient is feverish and complains of earache; the meatus is swelled and vascular; and these symptoms are soon followed by thin yellowish discharge. A purgative should be given; during the early stage the ear should be fomented or soothed with a large bran poultice; the discharge should be constantly washed away; and if it continue after the health is restored, the astringent applications to be presently mentioned must be used. The surgeon should not allow the parents to believe that an habitual discharge is salutary, or that there is any fear, under proper treatment, of "driving it in upon the brain."

In otorrhœa, *i. e.* purulent discharge, following internal otitis, the general health must be improved by tonics, alteratives, and aperients; and by warm baths (cold bathing is almost sure to be injurious); and the local disease must be treated by the cautious use of stimulants and astringents. The ear should be twice daily, *very gently*, syringed out with warm water; and immediately afterwards a tepid lotion of alum or sulphate of zinc, or acetate of lead may be dropped into the meatus till it is filled, and after remaining there two or three minutes, be allowed to run out, F. 135, 136, 140.

If the discharge is very fetid, a lotion of two drachms of solution of chloride of lime to half a pint of water may be used, or F. 117; and if the case is obstinate, the whole interior of the meatus may be pencilled twice a week with a solution of nitrate of silver (gr. v. ad ℥i.), by means of a camel's-hair pencil. If the discharge, as sometimes happens, causes excoriation of the auricle, or of the neck, these parts must be first fomented, and then smeared with an ointment of hyd. præcip. alb. But it seems advisable not—as a general rule—to insert ointments into the meatus.

If at any time during the treatment, an attack of acute pain and fever should come on, and the discharge should stop suddenly, leeches, purgatives, and fomentations must be resorted to, and all astringent applications be abandoned till these acute symptoms have subsided.

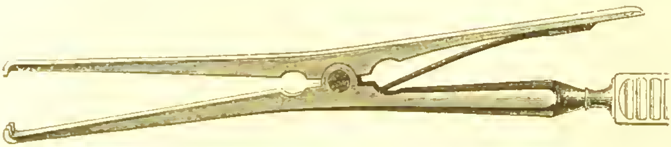
IV. A THICKENED state of the CUTICLE lining the meatus is not an uncommon sequel of neglected otorrhœa. The loose flakes of cuticle that sometimes fill the meatus, and the discharge, must be removed by syringing with warm water; and then the membrane should be brushed over with a weak solution of nitrate of silver, and afterwards with dilute citrine ointment (F. 168) melted and applied warm with a brush. Cleanliness is of the greatest consequence, as this affection is very apt to return if it is neglected.

V. POLYPUS.—This term includes two sorts of morbid growths. The first, says Mr. Wilde, consist of fleshy pedunculated growths, nearly colourless, having a thin cuticular covering, unattended with pain, not appearing as the result of inflammation, and not accompanied with discharge, and usually attached to the middle glandular portion of the meatus. These are extremely rare. The others, which are very common, and which grow chiefly from the very bottom of the meatus, are consequences of otorrhœa, and are always attended with discharge. They are usually found of the size of a pea or bean, but may, of course, be much smaller, or may be so large as to project from the meatus. When small they are usually of a florid red colour. The author has examined several specimens which had been removed by Mr. Harvey, and which consisted of fibro-plastic cells, with more or less of perfectly-developed fibro-cellular tissue, and of almost structureless gelatinous substance. There is yet another polypus-like tumour which may be met with in the external meatus—viz., cancer. In its earliest stage, this may not be distinguishable, except by microscopic examination after removal; the rapid return of the growth, and the occurrence of palsy of the face, and other signs of the contamination of neighbouring organs, will in time reveal the nature of the case.

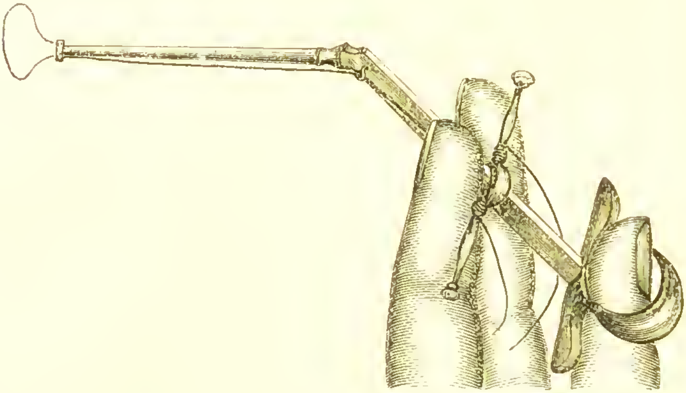
Treatment.—The polypus must be removed completely; the point of its attachment be touched with lunar caustic, which must be applied from time to time, whenever it seems likely to sprout again, and the meatus must be regularly syringed with an astringent lotion.

The lunar caustic should either be cast in very fine sticks, like the leads of a patent pencil; or the tip of a fine probe should be coated with it, so that it may be applied exactly to the spot where it is required.

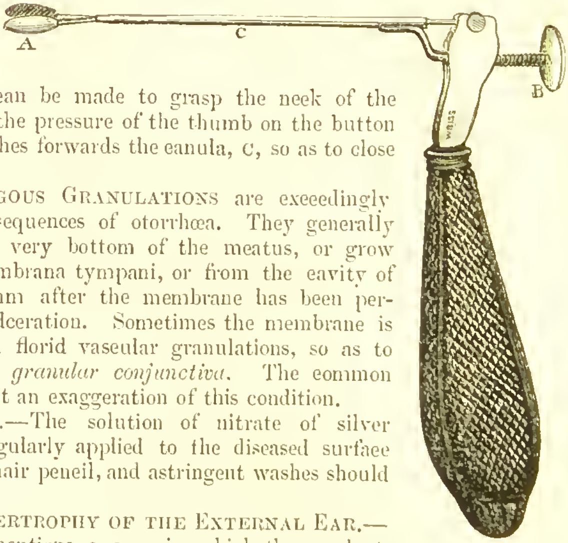
For the removal, the surgeon may employ either a stout Assalini forceps, here shown; from which the writer has seen excellent results



in the hands of Mr. Harvey, whom he has had to thank for abundance of specimens sent him for microscopical examination; or Mr. Wilde's snare. This consists of a fine steel stem, five inches long, and bent in the middle, in order that the hand which holds it may not get into the way of the eye. It has loops at the end and at the angle, through which a fine wire passes; there is a moveable cross-bar, to which the ends of the wire are tied: and a thumb-hole to hold it with. The wire should be just long enough to enable the cross-bar to be drawn back to the thumb-hole. In using the instrument, the bar is pushed forwards so that the wire may form a loop at the end; this is to be put carefully round the neck of the polypus; when, by pulling the bar back to the handle, it will cut the neck through.*



Another ingenious instrument was constructed by the late Mr. Avery, and is shown here. The forceps' blades, A. when properly introduced, can be made to grasp the neck of the polypus, by the pressure of the thumb on the button B, which pushes forwards the canula, C, so as to close the blades.



VI. FUNGOUS GRANULATIONS are exceedingly common consequences of otorrhœa. They generally occur at the very bottom of the meatus, or grow from the membrana tympani, or from the cavity of the tympanum after the membrane has been perforated by ulceration. Sometimes the membrane is covered with florid vascular granulations, so as to resemble the *granular conjunctiva*. The common polypus is but an exaggeration of this condition.

Treatment.—The solution of nitrate of silver should be regularly applied to the diseased surface by a camel's-hair pencil, and astringent washes should be injected.

VII. HYPERTROPHY OF THE EXTERNAL EAR.—Dr. Graves mentions a case in which the pendant lobes of the ear became thickened and elongated through a deposit of fat into their cellular tissue; in a patient who died of fatty degeneration of the liver. The author has seen one or two cases in which the whole external ear was excessively enlarged and thickened; but he would not have included them in this chapter, had not Dr. Graves appeared to consider the affection an uncommon one.* Gouty deposits are not seldom met with.

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* Wilde's Aural Surgery, p. 420.

VIII. ECZEMA of the auricle is a very troublesome affection; and if it becomes chronic, is apt to produce thickening of the lining membrane of the meatus, and opacity of the membrana tympani. The *treatment* consists, during the acute stage, in active purgation (F. 33, &c.) and warm poppy fomentations; saline and alkaline medicines, and good diet. In the later stage, the black wash may be used as an injection, and the dilute citrine ointment be smeared over the auricle at bedtime. Bark, with liquor potassæ, or iodide of potassium, may be given with benefit, or cod-liver oil; and in obstinate cases chloride of arsenic. (F. 97.)

SECTION III.—AFFECTIONS OF THE TYMPANUM AND INTERNAL EAR.

1. ACUTE INFLAMMATION of the membrana tympani, the *myringitis* of Wilde, is so closely connected with inflammation of the tympanal cavity, or *otitis interna*, both in its causes, symptoms, and consequences, that we may treat of them together. The usual *causes* are cold, especially exposure to currents of cold air; or sea-bathing; or violent syringing or probing, or otherwise irritating an inflamed ear. These inflammations may also come on during the course of fever, and most particularly during scarlatina, and may be caused by rheumatism and gout.

Symptoms.—Sudden and intense pain in the ear; often so excruciating as to produce delirium; increased by coughing, sneezing, and swallowing; and generally coming on first at night, and always worse at night; feeling of fulness in the ear; tenderness and soreness in its vicinity; *tinnitus aurium*, that is, unnatural noises of various sorts, heard by the patient; *deafness*, partial or complete (except that in some rare cases there is morbid sensibility to sound), and violent fever. On examination during the first stage the meatus is found more or less red, swelled and tender, and dry; the membrana tympani dull, opaque, and vascular. If the acute symptoms go on from bad to worse, suppuration occurs within the tympanum and mastoid cells, with most intense pain, and possibly facial paralysis; and at last the membrane ulcerates or bursts, and allows of the discharge of pus from the external meatus. In other more severe or neglected cases inflammation within the cranium may occur and prove fatal. See p. 426. In less severe cases, the membrane may be left thickened and opaque, and the cavity blocked up by adhesions; or there may remain an obstinate otorrhœa, which may give rise to caries of the bone, and mischief within the cranium hereafter.

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* Graves's Clinical Medicine, p. 581.

Treatment.—This disease must be combated by vigorous antiphlogistic measures. Leeches should be repeatedly applied both to the mastoid bone, and in the depression immediately below the auricle between the jaw and mastoid bone, and as Mr. Wilde directs, by means of a leech glass to the orifice of the meatus itself. Fomentations (p. 419) and poultices should be incessantly applied, and the bowels should be opened by calomel and efficient purgatives. Should the acute symptoms not be mitigated by these measures, and especially if there should be any sense of fulness, or swelling, or fluctuation over the mastoid process, Mr. Wilde recommends an incision, an inch or more long, to be made with a stout scalpel through the periosteum, down to the bone, parallel to and an inch from the attachment of the auricle; and Mr. Harvey* also strongly advocates this measure, not merely to relieve effusion already existing under the periosteum, but by creating a free discharge of blood, to cut the disease short, and prevent further mischief. Mercury should be given so as gently to affect the mouth, and blisters be applied when the acute stage is subsiding; or a portion of the incision, if made, may be converted into an issue.

Extreme pain of a neuralgic or rheumatic character accompanying otitis may be allayed by painting with tincture of aconite, or with solution of extract of belladonna in warm laudanum, behind the auricle; as in treating the so-called rheumatic ophthalmia.

II. Subacute and Chronic Inflammation.—The researches of Toynbee and Wilde have shown most conclusively, that by far the majority of cases of deafness are not nervous, as is sometimes thought, but depend on changes wrought in the tympanic cavity by subacute or chronic inflammation. Mr. Toynbee divides the diseased appearances in the tympanic cavity into three stages. In the *first* stage, the lining membrane retains its natural delicacy of structure, but its vessels are enlarged and tortuous; blood is sometimes effused into its substance, or on its attached surface, or sometimes between it and the membrane of the fenestra rotunda; and sometimes lymph is effused on its free surface. In the *second* stage the membrane is thickened and flocculent; and occasionally covered with cheesy, tuberculous, or fibro-calcareous concretions; but the morbid change most frequently observed consists of fibrous bands, which are sometimes numerous enough to occupy nearly the whole of the cavity. In some instances they connect the inner surface of the membrana tympani to the inner wall of the tympanic cavity; or to the incus and stapes; but by far most frequently they extend from the crura of the stapes to the adjoining wall of the tympanum, so that this bone is, as it were, completely enveloped in a fog of adhesions. In the *third* stage, the membrana tympani is ulcerated; the ossicles discharged, and the whole middle ear disorganized; caries of the bone and abscess may follow.

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* On Rheumatism, Gout, and Neuralgia of the Ear and Head, by William Harvey, Lond., 1852.

The *causes* of the less severe varieties of otitis are the same as those of the acute, but of less intensity;—exposure to cold; injudicious bathing; the weak and unhealthy states of the system left by fever, or the exanthemata; the scrofulous diathesis, especially if food, clothing, and fresh air be deficient; and the gouty and rheumatic diatheses.

Symptoms.—These, unfortunately, are often so slight, that the patient gives no heed to them, till in process of time he finds himself altogether deaf in one or both ears. A slight *woolly* sensation, or occasional noises or ringing, with variable obtuseness of hearing, and slight aching, are the most frequent.

Treatment.—The general indications are to improve the health; to relieve local inflammation by leeches—applied repeatedly, so long as they give relief to pain, noises, and headache—and by counter-irritants, such as small blisters, applied in succession over the mastoid bone, or to the nape of the neck. The feet should be kept warm, and the skin be cleansed by warm baths. Any diseased state of the external meatus should be remedied by the measures spoken of in the preceding section, and all discharges should be treated by mild astringent injections. *Mercury* is of all remedies the most efficacious for removing the consequences of protracted otitis. It should be given in small doses, long-continued, such as one grain of the hyd. c. cretâ, night and morning; or the bichloride, which is spoken of in the highest terms, both by Harvey and Wilde. It may be given alone, or with the tincture of bark, or of steel, F. 87.

There are some forms of otitis, connected with peculiar diatheses which require notice, and especially, first, the *rheumatic*, which has been much studied by Mr. Harvey. This may be acute, and may be accompanied with general rheumatism, and may require the treatment already prescribed for acute otitis; or may be subacute or chronic. Loud noises in the ear, deafness, rheumatic or neuralgic pains about the head or face or other parts, generally becoming worse at night, and tenderness or stiffness of the scalp or neck, are the common symptoms: leeching, and colchicum given in regular small doses, with or without mercury, are the remedies for the more acute cases; the iodide of potassium, guaiacum (which is strongly recommended by Harvey), with bark or sarsaparilla, for the more chronic.

Otitis may also be connected with gout,—for the treatment of which, the remarks on inflammation, p. 41, may be consulted;—or with scrofula, or with mere debility and cachexia, in which case the cod-liver oil and bark, or steel, will be of great use; or with secondary syphilis, for which the iodide of potassium and sarsaparilla, or corrosive sublimate, are the most appropriate remedies.

The local treatment of chronic deafness from inflammation of the membrana tympani, comprises the following points. Discharge must be washed away by the remedies prescribed for otorrhœa. A granular or vascular state of the bottom of the meatus, or a thickened and opaque condition of the membrana tympani, may further be remedied by the regular application, once or twice a week, with a camel's-hair pencil, of a solution of from two to four grains of nitrate of silver, to an ounce of distilled water, and afterwards of the dilute citrine ointment. When the secretion of wax is absent, and when the membrana tympani is tense and dry, the dropping of a few drops of glycerine into the meatus at bed-time, as recommended by Mr. T. Wakley, is a great comfort to the patient.

III. CARIES, or necrosis of the petrous or mastoid bones, is a frequent consequence of suppuration within the tympanum or mastoid cells, or of neglected otorrhœa. Constant fetid discharge. fungous granulations choking the meatus; deafness; palsy of the side of the face; dead bone felt with the probe; probably abscess over the mastoid process, or abscessoccurring amongst the muscles of the neck, and pointing low down, are the symptoms. We may reiterate the injunction, that prevention is better than cure; that an early incision down to the mastoid bone may prevent caries, but that, at all events, if matter forms, it should be at once freely evacuated. Any loose portions of bone should be extracted. Sir P. Crampton drew from the meatus of a young lady a piece of bone comprising the entire internal ear—vestibule, cochlea, and semicircular canals, with a small portion of the inner wall of the tympanum. The patient had urgent symptoms of inflammation of the brain, with hemiplegia, and total deafness of one ear, but ultimately recovered. The discharge should be carefully washed away by injections, as F. 136.

IV. INFLAMMATION OF THE DURA MATER, with effusion of greenish-yellow fibrine; abscess within the brain; plugging of the sinuses or jugular vein with dirty-looking fibrine, from the entrance of fetid secretion into them; and general pyæmia, may be consequences of ear disease, just as they may of fracture of the skull, p. 340, and the observations we have made on the insidious approach of mischief within the head in the one set of cases apply equally to the other.

V. EARACHE—(*otalgia*). This term ought to be restricted to signify *neuralgia* of the ear. Genuine *neuralgia* of the ear,—occurring in fits of excruciating pain, shooting over the head and face—may be distinguished from *otitis* by the sudden intensity of the pain—which is not throbbing,—does not increase in severity,—is not attended with fever,—and comes and goes capriciously. Its *causes* are the same as those of neuralgia generally, but particularly caries of the teeth; and its *treatment* principally consists in removing carious teeth, or stopping them, and giving purgatives, followed by quinine and afterwards iron. The tincture of aconite may be painted behind the auricle. We cannot too strongly impress on the surgeon that what is popularly called earache is an inflammatory pain, to be treated by leeches, fomentations, and purgatives.

VI. PERFORATION OF THE MEMBRANA TYMPANI may be the consequence of laceration by violence. As we have before said, this very often accompanies fracture of the petrous bone; but it may be caused also by blows on the head, boxes, as they are called, on the ear; by violent blowing of the nose, by which means a current of air is forcibly injected through the Eustachian tube; by forcibly syringing, which, as Mr. Toynbee observes, may easily rupture a thinned and dry membrane; by descent in the diving-bell; by the introduction of foreign substances; and lastly, by loud noises, especially the discharge of cannon. Sense of shock in the ear, bleeding and deafness, are the immediate symptoms. If inflammation comes on, it must be met by the measures detailed above; and if deafness continue, as a result of the aperture, it must be treated as we shall show presently. 2. Perforation is far more commonly the result of acute otitis, and suppuration within the tympanum. (See Otorrhœa and Otitis.) 3. It may also result from chronic inflammation and ulceration.

The *symptoms* which indicate an aperture in the membrane are, that perhaps the patient is conscious of air passing from the ear during swallowing; or that he can taste or perceive in his throat substances applied within the meatus. On examination with the speculum, the aperture, if large, may be discovered, and may, perhaps, be seen to cast a shadow on the tympanum beyond; or if the patient inflate the tympanum, in the manner to be presently described, air-bubbles and mucus may be seen to issue from it.

The *consequences* of perforation, if so small that it is capable of being closed by a film of the natural moisture of the parts, are very slight. But a large opening causes great deafness.

Treatment.—Otorrhœa, or any other diseased condition, should be treated as already directed; and the nitrate of silver may be applied by means of a fine probe coated with it (F. 193) to the aperture. But if the opening should not heal, or if the case be chronic with a considerable loss of substance of the membrane, some means should be devised to render the tympanum again a closed cavity, which is essential for perfect hearing. Some patients had long been in the habit of putting a drop of water or of oil into the ear, with great benefit; the good effects, no doubt, resulting from the closure of the aperture by a thin film of the liquid. But in 1848, Mr. Yearsley made known the simple but important fact, that a little bit of cotton-wool, moistened with water or oil, or, still better, with glycerine, if passed down the meatus, and applied against the orifice, will act as an excellent substitute for the lost membrane. The patient can usually be taught to introduce and withdraw this cotton with great nicety, by means of a forceps or bodkin, and to place it exactly in the right spot. Whether it requires to be renewed twice, or once daily, or not so often, depends upon circumstances. Mr. Toynbee uses, instead of cotton, artificial membranes of small oval pieces of thin India-rubber.

VII. COLLAPSE OF THE MEMBRANA TYMPANI is a condition in which that part is drawn inwards, so as to be concave externally and leave the handle of the malleus unnaturally prominent. It is usually a consequence of chronic otitis, the membrane being opaque and thickened; but sometimes is said to be a functional disorder, and the structure of the membrane to be normal. The latter is the condition in which it is said that the patient can hear better in a noise, or when stimulants, such as a few drops of nitric ether, are dropped into the meatus. supposing all traces of inflammation to have subsided. Any plan of drawing the membrane outwards seems hopeless.

VIII. THE EUSTACHIAN TUBES, as is well known, are passages between the cavity of the tympanum and the throat, allowing the air to enter and escape from that cavity as may be required. But Mr. Toynbee has given good reason for believing that, contrary to the common opinion, the tubes are not habitually open; and that so far from permitting constant and uninterrupted communication, their orifice is always closed, except during the act of swallowing. During this act, the tensor and levator palati muscles "open the guttural orifice of the tube, afford free egress to the mucus secreted by the lining membrane of the tympanum, and allow air to enter or leave the tympanic cavity." That this is so, is rendered probable by the circumstance that the act of swallowing gives relief to the uneasy feelings in the ear experienced by persons who descend in a diving-bell; which it does by allowing the condensed air to enter the tympanum, and so to make the pressure on its inner surface equal to that on its outer. "Again," says Mr. Toynbee, "if an attempt is made to swallow, while the nostrils are closed by the finger and thumb, a sensation of fulness and pressure is experienced in the tympanic cavity; in consequence of the air being then forced, during the act of deglutition, through the open tube into the tympanum; and this sensation continues until, by another act of swallowing, the tube is reopened, and the confined air escapes into the fauces." It has further been shown, as we observed when treating of perforation of the membrani tympani, that the cavity requires to be a closed one for perfect hearing, and that the Eustachian tube ought to be pervious, but not always open.

These things being premised, we are prepared to understand the nature of that which has been called *throat deafness*, and which depends on the morbid states of the tympanum, extending from the throat through the Eustachian tubes. In the first place. the common catarrhal deafness,—the ringing and crackling noises in the ear, with which every one is familiar; the change of sensation experienced on blowing the nose or swallowing—supplies the commonest instance. This, in most cases, is trivial, and soon gets well. But in delicate children it is often otherwise, and a slight but increasing amount of deafness remains, depending, no doubt, on a swelled condition of the tympanal membrane, and accompanied, as is natural, with a general flabby and relaxed condition of the mucous membrane of the nose and fauces. The same thing may happen to adults. This condition will be distinguished by the swelled tonsils and relaxed throat; by the aggravation each time cold is caught; by the sudden noises from bursting of mucous bubbles, heard by the patient, and by the surgeon through the *otoscope*.

This, as improved by Mr. Harvey, is a flexible stethoscope, one end of which, expanded into a hollow bell, is put over the patient's ear, whilst the other is applied to the surgeon's. Then, if the patient be desired to close his nose and mouth firmly, and while doing so, to make an effort as in blowing the nose, or to swallow, the surgeon may hear the shock of air against the membrani tympani if the tubes are pervious; he will hear a squeeling or gurgling sound if they contain fluid; whilst if they are impervious, he will of course hear nothing. Yet he must recollect that some patients cannot acquire the knack of inflating their tympanum, and it must not be too hastily assumed that they are impervious.

Of the severer forms of inflammation of the tympanal cavity we have already spoken.

Treatment.—The general health must be braced by bark, steel, cod-liver oil, and other tonics (F. 87, 65, &c.); and the relaxed mucous membrane, by gargles, of which the author can recommend the sulphate and chloride of zinc (F. 109), most strongly, and by creosote inhalation; and repeated blisters may be applied behind the ears. It has been proposed that the tonsils and uvula should be extirpated in these cases. But although it may be justifiable to remove a superficial slice of enlarged tonsils, on other grounds, yet it is now amply proved, that enlargement of the tonsils by itself is not a cause of deafness; and, *à fortiori*, that the cutting out of healthy tonsils cannot improve the hearing: besides that, there is good reason for believing, that this mutilation rashly performed, may have the most disastrous consequences on the voice, on the general health, and, as Mr. Harvey believes, on the proper development of the generative organs. See chap. xv.

The operation of *catheterism of the Eustachian tubes*, for the purpose of dilating them; or of injecting warm water or air, or medicated liquids or vapours into the cavity of the tympanum, has also been much advocated. But the author cannot recommend these operations for general adoption; first, because they are painful, and because he believes they very seldom, if ever, do any real good; and secondly, because they are dangerous, and have proved fatal in more instances than one. When it is considered that in some cases the bony partition between the Eustachian tube and the carotid canal is almost entirely absorbed; and that in others there is but the thinnest shell of bone, or, perhaps, only a mere membrane between the tympanic cavity, or mastoid cells, and the cavity of the cranium or jugular fossa (all of which morbid changes the author has seen in Mr. Toynbee's collection), it will be readily understood how the pokings in the dark at the Eustachian tube, and forcible injections of the tympanum that we read of, may have very easily produced fatal results. Possibly the reason why more mischief has not been done, is, that the catheter has been poked somewhere, but not into the Eustachian tube. *Perforation of the membrana tympani*, which has been proposed to be done, in order to allow the access of air to the tympanum when the natural openings in the throat are obliterated, is another operation of very doubtful utility.

IX. FUNCTIONAL NERVOUS DEAFNESS.—Deafness is said to be *nervous*, when it depends on general torpor and debility, and is better at some times than at others, especially in fine weather, and when the patient is cheerful or excited, and the stomach in good order, and when there is an entire absence of all symptoms or vestiges of inflammation. But such a form of deafness is rare; and Mr. Toynbee has shown, that even in very old persons, in whom it is often supposed to be common, the usual cause of deafness is not defect in the nervous apparatus, but thickening, adhesions, and other effects of inflammation of the tympanal cavity.

Treatment.—Aperients, with diffusible stimulants, especially ammonia, arnica, and valerian; stimulating gargles, *masticatories* of pellitory, &c. If the meatus is dry, and altogether deficient in cerumen, great benefit may be derived from the introduction of a few drops of fish-oil, or of ox-gall, or of æther, or of sp. am. ar. into the meatus, and the application of mustard, and other counter-irritants behind the ear. *Electricity* may be mischievous.

X. ORGANIC NERVOUS DEAFNESS.—Deafness may be caused by *blows on the head*, or fracture, which produces either concussion or rupture of the auditory nerve. Depletion, if any inflammatory symptoms are present, with alteratives and counter-irritants afterwards, are the only remedies.

Deafness may also be produced by *organic alterations in the brain*, and may be attended with epilepsy or idiocy, or may be a consequence of apoplexy or convulsions. The *treatment* must be the same as for amaurosis arising from similar causes (p. 408).[*]

CHAPTER XIV.

DISEASES AND INJURIES OF THE FACE AND NOSE.

SECTION I.—AFFECTIONS OF THE OUTER PARTS OF THE FACE, NOSE, AND LIPS.

I. SALIVARY FISTULA is said to exist when the *stenonian* duct has been perforated by a wound or ulcer, so that the saliva dribbles out on the cheek.

Treatment.—In the first place, a good passage must be established from the duct into the mouth. This may be done by puncturing the mouth through the fistula in two places, passing a small skein of silk, or, still better, a piece of very flexible wire, through the apertures, and securing the two ends in the mouth by a knot. After a few days, when a sufficient aperture into the mouth has been established, means must be employed for closing the fistula. Its edges may be pared and brought together in a straight line, by means of needles and the twisted suture. To facilitate this, the skin may, in some cases, be dissected up, so that it may be shifted along. In some cases, the cautery, a small blunt one, at a black heat, may be passed round the edges, to make them contract. In cases of deep narrow fistula, Marhall's galvanic cautery may be used. In other cases, the aperture may be covered with a flap of skin raised from the adjoining parts.

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[*] Copland, Dict., art., Ear; Kramer on Diseases of the Ear, translated by Bennett; Pilcher on the Structure and Diseases of the Ear, Lond., 1838; Essay on the Ear, by Joseph Williams, M.D., Lond., 1840; Harvey on Deafness and Enlargement of the Tonsils, Lond., 1850; Toynbee, in Med. Chir. Trans., vol. xxiv.; Med. Gaz., 7th July, 1843; on Senile Deafness, Edin. Monthly Journ. of Med. Sc., Feb. 1849; On an Artificial Membrana Tympani, Lond. 1853; Yearsley on the Application of Cotton, &c., Lancet for 1848, vol. ii., pp. 10, 64, &c.; Toynbee, Lectures in Med. Times, vol. ii. 1855; W. R. Wilde, op. cit.

II. HYPERTROPHY.—The nose sometimes becomes prodigiously enlarged through an hypertrophy of the areolar tissue and skin, especially in persons who have been addicted to the pleasures of the table. Such tumours are very inconvenient and unsightly, but not dangerous. They grow slowly— are indolent and painless—the sebaceous follicles are much enlarged, and secrete profusely, and the skin is more or less mottled with veins.

Treatment.—If the patient desires it, the tumour may be removed with the knife; but the surgeon must first well examine his general health, and put him on regular diet. An incision may be made in the median line nearly down to the cartilage. Then an assistant distends the nostril with his forefinger, whilst the surgeon seizes the morbid growth, and shaves it clean off, close to the cartilage. After the operation, there will be considerable hæmorrhage from numerous vessels. Some of these may be tied, some may be pinched with a forceps, some may be secured with a very fine cambric needle and thread; and any general oozing may be restrained by the application of cold water or matico leaf, or, if it be obstinate, by plugging the nostrils, and making pressure with strips of plaster.

III. RHINO-PLASTIC, or TALIACOTIAN OPERATIONS.—When a portion or the whole of the nose has been destroyed by disease or accident, the deficiency may be restored by a transplantation of skin from an adjoining part; the operation being varied according to the extent of the deformity. But whether this mutilation arise from scrofulous ulceration, or from lupus non exedens, p. 76, or from scrofulous disease of the bones, or from syphilitic disease, plenty of time should be allowed before any operation is thought of, else it may be frustrated by a return of the disease.

1. When the *whole or greater part of the nose* has perished, a triangular piece of leather should be cut into the shape which the nose formerly presented, and be spread out flat on the forehead, with its base uppermost, and its boundaries should be marked out on the skin with ink. Then the remains of the old nose (if any) are to be pared, and the margins of the nasal aperture are to be cut into deep narrow grooves. When the bleeding from these wounds has ceased, the flap

of skin marked out on the forehead is to be dissected up, and all the cellular tissue down to the periosteum with it, so that it may hang attached, merely by a narrow strip of skin between the eyebrows. When all bleeding has ceased, the flap is to be twisted on itself, and its edges are to be fitted into the grooves made for their reception, and to be fastened with sutures. The nose thus made is to be supported, but not stuffed, with oiled lint; it should be wrapped in flannel to support its temperature, and if it become black and turgid, owing to a deficiency in the return of blood from it, a leech may be applied. When adhesion has thoroughly taken place, the twisted strip of skin, by which its connexion with the forehead was maintained, may be cut through, or a little strip may be cut out of it, so that it may be laid down smoothly.

2. The *septum* or *columna nasi* is often restored by the same operation with the nose itself, by means of a flap from the forehead; but it is better, as Mr. Liston proposed, to form it out of the upper lip at a subsequent operation. A strip is cut out of the centre of the upper lip, a quarter of an inch in breadth, and of its whole thickness. The frænulum having been divided, this strip is turned up, but not twisted; and its labial surface having been pared off, and the inside of the apex having been made raw, the two latter surfaces are united by the twisted suture, and the wound of the lip is also united by the same. During the cure, the nostrils must be kept of their proper size by introducing silver tubes occasionally.

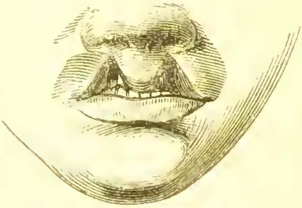
3. When *one ala nasi alone* is destroyed, a portion of integument may be measured out on the cheek, and be raised to supply the deficiency. But if both alæ are lost, or if the cheek be spare and thin, it is better to supply their place with skin brought from the forehead. The slip which connects the engrafted portion with the forehead will of course be long and thin; and in order to maintain its vitality, a groove may be made to receive it on the dorsum of the nose. But when union has occurred, this connecting slip may be raised and cut off, and the groove which contained it be united by sutures.

4. *Depression of the apex* of the nose is to be remedied by raising the parts, dividing any adhesions that may have formed, making, if necessary, a new *columna*, in the manner described above, and supporting the parts carefully with plugs of lint, till they have acquired firmness. But it may be done still more completely by a method which was proposed by Dieffenbach, and a modification of which has been practised with great success by Mr. W. Fergusson. "The point of a small scalpel," says Mr. Fergusson, "was introduced under the apex, and the alæ were separated from the parts underneath; next the knife was carried on each side between the skin and the bones, as far as the infraorbital foramen, taking care not to interfere with the nerves, when, by passing the point of my finger below the nose, I caused the latter organ to be as prominent as could be wished. I now passed a couple of long silver needles, which had been prepared for the purpose, with round heads and steel points, across from one

cheek to the other, having previously applied on each side a small piece of sole leather, perforated with holes at a proper distance; then I cut off the steel points, and with tweezers so twisted the end of each needle, as to cause the cheeks to come close to each other, and thus to render the nose prominent. Thus, by bringing the cheeks more into the mesial line, a new foundation, as it were, was given to the organ. Adhesion occurred in some places, granulations in others; in the lapse of ten days the needles were withdrawn, and in the course of a few weeks, when cicatrization was complete, the nose presented as favourable an appearance as could reasonably have been desired."*

5. *Depression of the ridge*, owing to the loss of the ossa nasi, may be remedied by paring the surface, and covering it with a flap of skin from the forehead; or by making a longitudinal incision, and engrafting a small portion of skin from the forehead into it; or, if the case is slight, by cutting out one or two *transverse* slips, and bringing the cut edges together by sutures, so that thus the surface may be stretched to its proper level.

IV. HARE-LIP signifies a congenital fissure of the upper lip, arising from arrest of development. Its usual place is just on the left side of the middle line; and it may exist on one side only, or there may be a double fissure with a small flap of skin between. With the imperfect development of the skin there is usually more or less of the same condition in the bone. That part of each superior maxillary bone which contains the incisor teeth, and which constitutes a distinct bone in the human embryo, and in many animals—the intermaxillary, or premaxillary of Owen—the divided hæmal spine of the nasal vertebra—may be disconnected on one or both sides, leaving a gap in the alveolus, which may possibly extend backwards to be complicated with fissure of the palate. This intermediate portion may be displaced and attached like a snout to the end of the septum narium. Sometimes the upper incisor teeth and their alveoli project through the fissure in the lip.



Treatment.—The first consideration is the age at which treatment shall be undertaken. Sir A. Cooper used to recommend that it should be put off till the child was two years old, and had cut some teeth, because of the supposed liability of young infants to be carried off by convulsions; but Mr. Fergusson and most modern surgeons believe the risk to be overrated, and prefer operating as soon as possible. Mr. Henry Smith has operated on the fourth day, and Mr. Bateman, of Islington, on the fourth hour after birth with success. Infants may die (just as little Jews die sometimes after circumcision). but such an event is especially rare.

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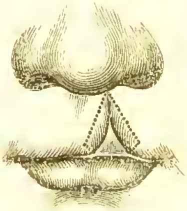
* Practical Surgery, 3rd edit., p. 578

The second point to be considered is, how to deal with the bone, should it project through the fissure. The old plan was to cut it off; but conservatism has gained the day here, as in most other departments of medicine, and at present the plan proposed by Gensoul, and improved by Haynes Walton, is adopted, of cutting perpendicularly through the alveolus with bone forceps between the incisor teeth, and gently bending back the projecting part to a convenient level. In some cases related in Cooper's Dictionary, this object was gained by the use of a truss worn for several hours daily; but if the operation is performed soon after birth, there will be no time for this.

The next step is one recommended by Mr. Walton; and consists in freely detaching the lip from the bones behind, so that it may hang loosely, and be brought together easily.

Fourthly, the edges of the fissure are to be pared. We take it for granted that the child has been quieted by chloroform, and that it is laid flat on the lap of a nurse, with its head on the knees of the surgeon, who sits in front. Then the bone having been bent back if necessary, and the lip freed as just described, the surgeon, seizing the lip by the corner of the fissure with his left forefinger and thumb, pierces it with a narrow knife at the top of the fissure just under the nose, and carries the instrument downwards, so as to shave off the edge of the fissure; and it is better to remove too much than too little. There is a nice manœuvre that should be adopted in finishing the incision. The knife should not be carried straight down, but should be carried inwards, in the direction shown in the cut, so as to save the very bottom of the cleft; by this means, when the parts are healed, there will be less of a notch left. This process is repeated on the other side, and the two strips are next detached from the upper angle. The edges of the fissure being thus made raw, the next step is to bring them into the nicest adaptation possible, and to keep them so. The usual method employed is the *twisted suture*, described at p. 128. Three of the fine lancet-pointed needles are thrust through the raw edges of the fissure. They should go through about two-thirds of the thickness of the lip. The first should be put through the lower angles, where it is most essential that the adaptation should be most exact; another may run through and compress any artery that bleeds; a third higher up. Then the centre of a long slip of lint, or of twine, should be wound round the uppermost pin and be brought round the others as shown at p. 129; besides which, Mr. Fergusson cements the suture and lip by a plentiful application of collodion.

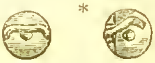


In order to prevent any strain on the stitches, it is now usual to put on a spring truss invented by Dr. Dewar, of Aberdeen, and so contrived as gently to press the cheeks towards the middle line. This is worn till adhesion is firmly established.

The diet of the patient, if an infant, will give no trouble. If he be older, it should be nutritious. There need be no hurry in withdrawing the pins; the fifth or seventh day will be soon enough; and then the cicatrix should be supported by plaster.

If union should fail, the pins or some other suture should be inserted again, to take the chance of union during the granulation stage.

Instead of the twisted suture, some surgeons trust to the common interrupted suture. The *button* suture, represented in the adjoining cut, is warmly recommended by Mr. Wood, of the Gloucester Hospital, who has very successfully cultivated this branch of plastic surgery. He uses on each side two perforated silver discs, having wires soldered to their backs, over which a double ligature is tied, after having been passed through the lip. Mr. Wood believes that by thus avoiding the pinching and rigidity of the needles, he obtains a more efficient and unobjectionable mode of union; and recommends the same suture in cases of divided perinæum and similar cases.†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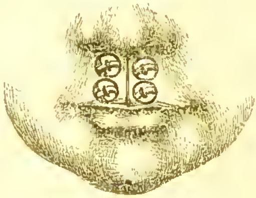

If the hare-lip is double, both sides may be operated on at once, the middle flap being transfixed by the sutures. But care should be taken to push up the middle flap towards the nose, so as to render the latter organ more prominent, as it is in general very flat in cases of hare-lip.

V. Cancer of the Lip is a very rare disease, and, according to Lebert, more commonly attacks the upper than the lower lip. It must be treated on the principles laid down at p. 117. What is popularly called *cancer of the lip* is in reality—

VI. Epithelioma, of which disorder the lower lip is the favorite seat. Epithelioma, the so-called cancer, or epithelial cancer of the lip, is a disease of middle, or *paulo-post*-middle life, and affects the lower rather than the higher classes, men much more often than women, and the left more often than the right side. There must be some sort of predisposition; but the first attack can very often be traced to some slight but incessantly renewed irritation, and especially smoking short earthen tobacco-pipes. Teeth encrusted with tartar, and the habit of holding rough twine between the lips, have been alleged as causes in particular cases. The disease begins as a crack or excoriation, covered with thick epidermis; or as a wart; or as a superficial hardness of the skin; and it usually begins on the red *prolabium*, or on the edge where this joins the skin. In its earliest stage it may continue, for a very long time, stationary or slowly progressing; most likely repeatedly shedding flakes of epidermis, and silently increasing in breadth and depth. At last, however, possibly from some irritating local application, a stage of active progress sets in, and is accompanied by corroding ulceration; and then comes a foul ulcer with hardened base, fungous wart-like edges, and surface covered with scabs of dried pus and epithelium, or exuding a fetid sanious discharge. If it proceeds unchecked, the lip is destroyed; the saliva dribbles from the mouth; the glands under the jaw swell; the muscles and lower jaw-bone are attacked by ulceration and caries; the teeth drop out. The health, sound at first, begins to give way; and the influence of this intense local irritation, combined with the difficulty of taking food, and the absorption of fetid secretions, are amply sufficient to destroy life.

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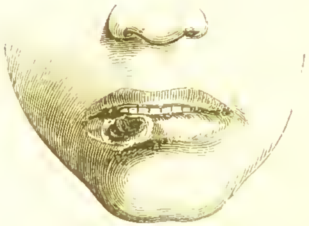
* Mr. Wood's buttons—natural size.

† See paper by Mr. Wood, in Med. Gaz., 1841; Haynes Walton, Med. Times, June, 1848; Fergusson, op. cit.



This disease, as to its nature, is probably in great measure local, and destroys life by its local progress, not by general diffusion over the system, as cancer. Its morbid anatomy has already been amply detailed, p. 105; suffice it to repeat that the dermis, the enlarged papillæ, muscles, glands, and bone are abundantly infiltrated with scaly epithelium; and Paget relates that in two out of seven autopsies, epithelial deposits were found in the heart or lungs. The only wonder, considering how abundant the epithelial nuclei are in the neighbourhood of the diseased part, is, that this is not universal. The diagnosis is generally easy; yet in the earlier stages it might be difficult to distinguish it from any other ulcers caused by irritation and disorder of the health. Mr. Earle showed that all the appearances of cancerous disease might be assumed by common ulcers near the outlets of the body, if subjected to much irritation, but that such ulcers admit of cure by removing foul teeth and other sources of mischief, and attending to the general health. The presence or not of enlarged cutaneous papillæ may serve as a diagnostic mark.

Treatment.—Extirpation, free and early, is the only remedy worth speaking of; and the surgeon's chief anxiety should be to remove all the affected tissues, without regarding the patient's appearance. The classical V incision, as Lebert terms it, may therefore be abandoned; and a clean sweep made with the knife. The wound must be brought together vertically by pins and the twisted suture; and, if desirable, in order to facilitate this, incisions may be made at each corner of the mouth. The operation may be successful; at all events the cure may last the patient's life; but quite as often, or more so, a relapse occurs within the space of from six months to two years. The more quickly the disease has relapsed, the more quickly it is likely to do so, after a second operation; yet the operation should be boldly repeated, and the glands or jaw-bone be removed, if necessary. Hannover relates the case of a man who was operated on for the first time in May 1834, for a disease of two years' duration; the second time in 1846; the third in 1849; the fourth in 1850; with good results up to 1852. No instance is known of a spontaneous cure of *ulcerated* epithelioma of the lower lip; and the knife, under chloroform, is infinitely less formidable than the daily miseries of the disease. In cases not fit for the knife, the palliative treatment of cancer must be adopted.*

VII. CORRODING ULCER OF THE FACE, LUPUS EXEDENS, CANCROID.—Vide p. 76. Epithelioma proves fatal, as we have just narrated, by the supervention of a corroding and intractable ulceration in a tissue previously infiltrated with epithelium. But we must recall to the student's memory, that a corroding ulcer, proving ultimately fatal, is apt to attack the face, without pre-existing epithelial, or cancerous disease. Lupus exedens is an instance. Another, closely allied, is a sort of corroding ulcer, which is very apt to affect the lower eyelid, nose, or cheek of the aged. It often affects some wart that has existed for years. It produces an irregular dryish glassy ulcer, without the hard base or warty edges of epithelioma, or of hard cancer; and so slowly progressive that it may sometimes be doubted whether the patient has died of the disease or of old age. The glands are not affected. Excision of such ulcer, or of its precursory wart, may be performed; but these are the cases in which a permanent cure may be hoped for by the use of arsenic as a caustic. The case of the late Pope, Gregory the Sixteenth, may be an example. He had a corroding ulcer on the nose, which was treated successfully with the arsenical paste, by M. Allertz, of Aix-la-Chapelle, so that the ulcer healed, and there was no relapse during the remaining eight years of the Pope's life. True epithelioma and cutaneous cancer may also affect the face, head, or ear; but it seems that in none of these parts is epithelioma so rapid in its progress, or so likely to relapse after operation as in the lower lip.

VIII. CANCRUM ORIS—(*Phagedæna oris, gangrenous erosion of the cheek*)—is a phagedæno-gangrenous affection of the lips and cheeks, occurring almost exclusively amongst the ill-fed squalid children of large towns. It appears to be a disease of debility, and to be induced by want of proper food and of fresh air, and by neglect of cleanliness. Like other disorders of a similar character, it is very liable to follow the measles or scarlatina, or any other severe and weakening illness.

Symptoms.—In the instances which have fallen under the author's observation, it has commenced as a shallow ulcer on the lip or inside of the cheek: with a peculiar dirty-gray or ash-coloured surface, and black edges. Sometimes it is said to commence with an exudation of a pale-yellow fibrinous matter, like that exuded in some forms of diphtherite, with which this disease has the greatest affinity. At the same time the face is swollen, the breath exceedingly fetid, and there is a dribbling of fetid saliva mixed with blood. If the disease proceeds, the ulcer becomes gangrenous, and destroys the cheek and gums; the teeth drop out, typhoid symptoms supervene, and the patient dies exhausted. The swelling which accompanies this disease shows nothing like active or healthy inflammation. It is moderately firm, or what may be called semi-œdematous, and is either pale, or else of faint-pink colour. In the most rapid form of the disease it commences at once as a black spot of gangrene, which slowly spreads, and is not accompanied by any inflammation whatever; all the parts around being quite pale and wax-like. The constitutional symptoms are at first those of weakness, and disorder of the stomach and bowels, and afterwards the rapid feeble pulse and stupor of typhus.

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* See Paget, Lectures, vol. ii.; Lebert, op. cit.; Hannover, op. cit.

Diagnosis.—The diagnosis of this affection is of some importance, because when a child has died of it, the parents, through ignorance or malice, are liable to bring the surgeon into trouble, by accusing him of having caused death through profuse mercurial salivation. The chief points of distinction are, that in this disease the ulceration or gangrene is *circumscribed*, and is generally confined to one side; and that it commences usually in the cheek, and that it only affects that part of the gums which is in close contiguity, and that the tongue is untouched. Whereas in severe mercurial salivation, the ulceration is diffused; the whole of the gums, and the lining membrane of the cheeks, and the tongue, as well as the palate, being affected from the first.

Treatment.—The indications are threefold. 1st. To evacuate and correct the secretions of the stomach and bowels by a dose of calomel, followed by rhubarb and magnesia. 2ndly. To keep up the strength by wine, beef-tea, and other nutritious articles, and by bark or quinine in sufficient doses. The *chlorate of potassa* has been strongly recommended, and may be given in doses of gr. xx.—xl. in the twenty-four hours. 3rd. To excite a healthy action in the diseased part by stimulating lotions, especially solution of nitrate of silver, alum, sulphate of copper, or the chloride of lime; and, lastly, if these means fail to arrest the disease, by applying the strong nitric acid so as to destroy the whole of the diseased part, in the same manner as was directed for hospital gangrene.*

IX. Cheilo-plastic Operations, by which are signified operations for the restoration of the lip, may be expedient when the lower lip has been so destroyed by cancrum oris, or by ulceration, or operation, as to occasion deformity, and difficulty of speaking, or of retaining the saliva. Such operations may consist in bringing soft parts from the sides of the face towards the middle line, and retaining them by a twisted suture, as in hare-lip; but the exact incisions required must depend on the circumstances of the case, which may vary *ad infinitum.* In other cases, sufficient substance to form a new lip may be raised from below, by making a curved incision from one masseter to the other below the chin. A vertical incision downwards in the middle line will allow a considerable flap to be raised on each side to the proper level to form a new under lip. The incision in the middle line must now be stitched together, and the new lip must be kept up to its proper place, and prevented from being again drawn down, by stitching its lower margin to the periosteum of the jaw. This plan was proposed by Dr. Hamilton, U. S. Operations may also be required for enlarging the mouth when too small; in which case, after sufficient incision, the cut edges of the skin and mucous membrane should be united by sutures, so that they may heal over (see Phymosis). In a case of this sort, Mr. Hancock, before making his incision, ascertained, by desiring his patient to grin, the exact insertion of the levators of the angles of the mouth, and carried his incisions to this spot. For contracting the mouth, if too large, or if one corner of it is rendered flabby and unmanageable by palsy of the portio dura, Mr. Hilton has cut a piece from one corner.*

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* See James on Inflammation, p. 527; Marshall Hall, in Lancet for 1839—40, p. 409; P. H. Green, ibid.; and also in Cycl. Pract. Surg., art., Cancrum Oris; Willis on Cutaneous Diseases; Hunt, Med. Chir. Trans., vol. xxvi.

SECTION II.—AFFECTIONS OF THE NASAL CAVITIES.

I. FOREIGN BODIES may be removed from the nose by a small curette, or scoop, or bent probe. If they cannot be brought through the nostrils, they may be pushed back into the throat. The removal should be effected as early as possible.

II. EPISTAXIS, or *hæmorrhage from the nose*, may, like other hæmorrhages, be produced, 1st, by injury; 2ndly, it may be an *active* hæmorrhage of arterial blood caused by general excitement and plethora, or by determination of blood to the head, or by the suppression of some other discharge; 3rdly, it may be a passive draining of venous blood, owing to obstruction of the circulation by disease of the heart or liver, or to a morbidly-thin state of the blood, together with relaxation of the vessels, as happens in scurvy, purpura, and the last stage of fever.

Treatment.—1. If the patient be red-faced, plethoric, and subject to headache and giddiness, the hæmorrhage may be regarded as a salutary effort of nature; a good purgative, F. 33, should be administered, the liver, bowels, and kidneys be thoroughly cleared, and the diet regulated; if the bleeding continues, the sulphuric acid, F. 24, may be given, to which sulphate of magnesia may be added if the bowels require it, or quinine, zinc, or steel, under other circumstances. 2. But the hæmorrhage requires to be stopped at once, either if it have continued so long that the patient will be injuriously weakened,—or if it arise from injury,—or if it be a *passive* hæmorrhage depending on visceral disease or general cachexy. If an upright posture, a bladder of ice applied to the forehead or a piece of cold metal to the back, with a draught of iced water or lemonade, and compression of the nostril, do not stop it, the patient may snuff up powdered gum, or gall-nuts, or powdered *matico;* and, these failing, the nostril must be gently plugged with lint. In very urgent cases, the posterior orifice of the nostril must be plugged also. This is easily done by passing a bougie, with a long piece of silk fastened to its end, through the nostril into the pharynx. The end of the silk in the pharynx is then brought through the mouth with a pair of forceps, and a piece of soft sponge, less than an inch in diameter, is tied to it. Then by pulling the silk back through the nose, the sponge is drawn into the posterior opening of the nostril. The plugs or coagula, in severe cases, should not be disturbed for three days.

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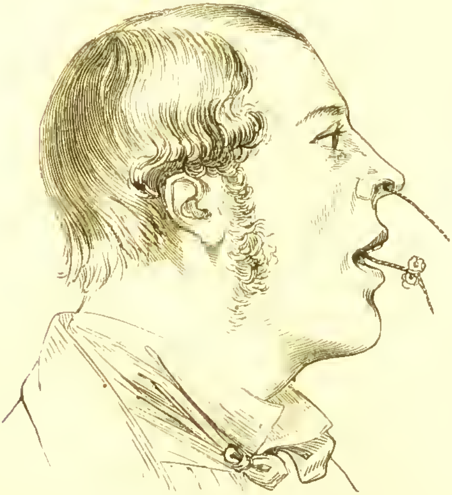
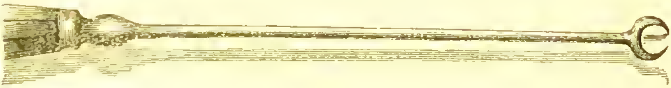
* See the surgical works of Fergusson, Syme, Pancoast, and Jobert de Lamballe; Hilton's Clinical Lectures, Lancet, 1853, vol. i.; Case of Restoration of Lip, by Dr. F. H. Hamilton, of the United States; Ranking, vol. xvi.; Mr. Hancock's case, Lancet, 10th Sept., 1853. By the way, it is much to be desired that plain English be used instead of dog Greek. To speak of a Rhinoplastic operation on the lip is ridiculous; and reminds one of the French phrases *biftek de veau*, and *rosbif de mouton*.



Local treatment being provided for, the case must be treated constitutionally. If there is great fever and vascular excitement, the nitrate of potash, F. 58, or tartar emetic, F. 68, may be of use; in cases in which the liver is deranged, the nitromuriatic acid and dandelion, F. 22; in cases in which the blood seems deficient in coagulability, alum, F. 187, sesquichloride of iron, gallic acid, F. 186, and turpentine, F. 74.

III. NASAL POLYPUS.—1. The common *gelatinous* polypus is a tumour of the consistence of jelly, pear-shaped, yellowish, slightly streaked with blood-vessels, attached by a narrow neck to the mucous membrane. The patient has a constant feeling of *stuffing* and cold in the head, which is increased in damp weather. If he force his breath strongly through the affected nostril, whilst he closes the other, the polypus may be brought into view. There are very often more than one of these tumours, and they are very liable to return when removed. If polypus be permitted to remain, it continually increases in size, blocks up the nostril, displaces the septum, and obstructs the other nostril, causes prodigious deformity of the cheek, prevents the passage of the tears, and may even cause death by pressure on the brain. The structure of these polypi is fibro-cellular or areolar tissue, covered with ciliated epithelium. The most usual point of attachment is one of the superior turbinated bones.

Treatment.—A probe should be introduced to feel for the neck of the polypus, which should then be seized with forceps, and be gently twisted off. If, as sometimes happens, it projects backwards into the pharynx, it must be extracted through the mouth with curved forceps if requisite, or a loop of stout twine may be passed, by means of a bougie, along the floor of the nostril into the pharynx, where it may be passed around the tumour by the fingers; and the tumour may be dragged forwards through the nostril. The double hook depicted here may be stuck into a polypus, and twisted round and round so as to tear it off. Such hooks are made by Savigny, of various sizes, for polypi of the ear, nose, and uterus. Wilde's snare for polypus of the ear, depicted at p. 422, may be useful. Formerly surgeons used to strangulate these tumours by passing the ends of the ligature through a double canula, in the same way in which it was customary to treat uterine polypi. But clean evulsion is a far preferable operation, and there is no fear of any bleeding that cannot be checked by iced water or by plugging. In a few cases it may be necessary to slit up the ala of the nostril where it joins the cheek, in order to get at the root of the tumour.



Polypus, it must be observed, is an empirical and antiquated term employed to signify any sort of pedunculated tumour attached to a surface, to which it was supposed to adhere like a parasite with many claws. Thus fibrinous clots attached to the interior of the heart used to be spoken of as polypi of the heart. But the most frequent seat of polypi is mucous membrane; and the most common and legitimate species is that *fibro-cellular* tumour, developed in the submucous tissue, and covered with entire mucous membrane, which we have just described. 2. Another variety is composed of *fibro-plastic* cells, and is, in fact, a mass of granulations, not developed into fibro-cellular tissue. This is, unlike the preceding, often caused by local irritation. The common aural polypus is an example. 3. Warty and epithelial growths with narrow necks constitute another variety. 4. Lastly, cancer, encysted tumours, or any other sort of tumour, which projects and has a narrow neck, may be called by the same name. For instance,

The *hydatid* polypus, a rare variety, described by Sir A. Cooper as consisting of a number of thin vesicles filled with a watery fluid, and attached by a peduncle, bursting upon the slightest pressure. Sir A.

Cooper recommended that the peduncle should be touched with a hair-pencil dipped in butter of antimony.

IV. CANCEROUS TUMOURS, projecting into the nasal cavities from the antrum or the adjoining parts, have been described as *fungoid* or *carcinomatous* polypi. Rapidity of growth, a bleeding fungating surface, and pain and signs of cachexia, will probably be diagnostic marks sufficient to deter the surgeon from attempting evulsion with forceps. It must be remembered that soft cancer originating within the cranium may come down through the ethmoid into the nose.

V. RHINORRHŒA, or OZÆNA, so called from its fœtor, signifies a purulent or sanious discharge from one or both nostrils. Like otorrhœa, it is but a symptom, and it will be necessary to consider the morbid conditions on which it may depend.

1. *Catarrhal Rhinorrhœa.*—The writer has seen very many cases, in which patients of delicate constitution, after a tedious common catarrh, have been troubled with most profuse and obstinate purulent discharge from the nasal cavities, often very fetid in the morning; attended with great weight and stuffing in the head, copious flow of tears, frontal headache, relaxed throat, cough, and general signs of debility; but more especially great depression of spirits. Sometimes, under such circumstances, the mucous membrane swells into red fleshy eminences. In a case in which the writer was consulted this year, a portion of the swelled mucous membrane had been mistaken for polypus, and it had been proposed to extract it. This state of things is often accompanied with catarrhal deafness, p. 429. The *treatment* is easy, and includes removal to a dry bracing atmosphere, aperients, bark with mineral acid, and the inhalation every evening of the steam of boiling water, to which twenty or thirty drops of creosote have been added. For the mode of inhaling, see chap. XV.

2. *Scrofulous Rhinorrhœa* generally begins early in life, and depends on inflammation or ulceration of the mucous membrane. It may be a consequence of the catarrhal variety, or may follow some fever, or may begin spontaneously. The discharge is more fetid in itself; and not only so, but it is mixed with exudation, and collects in the upper part of the nasal cavities and there putrefies, giving rise to an odour that causes the patient to be a nuisance to all about him. If the case goes on from bad to worse, the bones may be implicated; either the septum may be eaten through, which is of little consequence, or the nose may sink in, and the same hideous deformity may ensue that was formerly not uncommon in secondary syphilis. *Treatment.*—The writer has often been surprised at the inefficient treatment pursued in these cases; in which, although there is no danger to life, yet the nauseous effluvium that issues from the patient renders him a pest to himself and all about him. He some time since treated a highly-respectable female, who had long been afflicted in this way, and had been cruelly salivated by a chemist, and excoriated with a nitrate of silver injection, with which she had been supplied at an hospital. The relief afforded by a *large* syringe daily used so as to wash away all clots and collections of

matter with a copious stream of warm water, to which a little chloride of zinc, F. 127, 136, may be added, is unspeakable. A leech or two should be applied to the inside of the nostril if the bridge of the nose is tender, or if there are any marks of obstruction about the lachrymal duct. The citrine ointment, F. 168, may be thoroughly applied by a camel's-hair brush, and bark, iodide of potassium, cod-liver oil, and other anti-scrofulous remedies be administered in tedious cases.*

3. *Syphilitic Ozæna* requires no further remarks. We may observe that the presence of foreign bodies should always be inquired into in any case of discharge from the nostrils; and that the examination may be facilitated by chloroform, and by the ear speculum, or by dilating the nostrils with forceps.

VI. IMPERFORATE NOSTRILS.—The nostrils are sometimes *imperforate*, owing to congenital malformation. The passage may (if the parents wish it) be restored by a cautious incision, and must be kept open with bougies. If, however, the obstruction be seated far back it ought not to be meddled with.

SECTION III.—AFFECTIONS OF THE ANTRUM AND JAWS.

1. ABSCESS OF THE ANTRUM may be caused by blows on the cheek, but it more frequently results from the irritation of decayed teeth. It has been caused in a newly-born infant from injuries received during parturition; the face having presented to the pubes.† The *symptoms* are permanent aching and uneasiness of the cheek, preceded probably by acute throbbing pain and fever and rigors, and followed, if an opening is not made soon, by a slow, general enlargement. This, if permitted to increase, causes bulging of the cheek, extrusion of the eye, obstruction of the lachrymal duct, depression of the hard palate, loosening and dropping out of the teeth, and closure of the nostril. The parietes of the cavity sometimes become so thin from distension, that they crackle on pressure like parchment. Sometimes (though rarely) the matter makes its way into the nostril; and sometimes the abscess points externally, or bursts into the mouth.

Treatment.—A free aperture may be made into the cavity. If either of the molar teeth be loose or carious, it should be extracted, and a trocar be pushed through the empty socket into the antrum. But if all the teeth are sound, or if they have been all extracted before, an incision should be made through the membrane of the mouth above the alveoli of the molar teeth, and the bone be pierced by a strong pair of scissors or trocar, as represented by the figure in the following page. The instruments should not be made of too highly-tempered steel, lest they break. The cavity should be frequently syringed with warm water, in order to clear away the matter, which is sometimes thick like putty. If the discharge continues profuse and fetid, search should be made with a probe for loose pieces of bone, which should be removed without delay, the aperture being enlarged if necessary.

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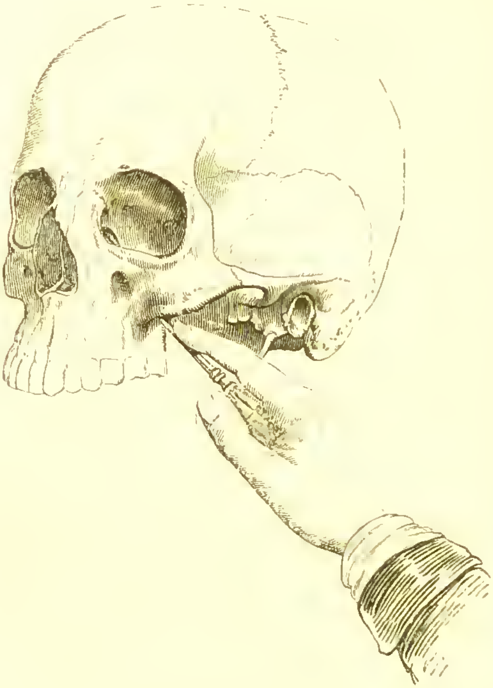
* See a Paper by R. Druitt, for further details of the Treatment of Ozæna, Med. Times, 1858, vol. ii., p. 417.

† G. A. Rees, Med. Gaz., N. S., vol. iv., p. 860.



II. Dropsy of the Antrum.—The antrum may become enormously distended, in consequence of an accumulation of its natural clear mucous secretion, if the aperture into the nostril has become obliterated. In a case which occurred in Mr. Fergusson's practice in the King's College Hospital in 1850, there was great protrusion of the cheek, and of the hard palate, and other signs of tumour, so that the patient was sent up for the purpose of having the bone extirpated; but on examination it was discovered that the antrum was greatly distended with a yellow viscid fluid containing brilliant particles of cholesterine; and an opening having been established through the anterior wall of the cavity, the patient was soon discharged cured.* In some cases the parietes are so thin as to crackle on pressure.

III. Tumours of the Upper Jaw-bone may present themselves in very great variety. Thus, in addition to the abscess and dropsy of the antrum, there may be—

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* Med. Times, 18th May, 1850.

1. *Hypertrophy of the bone*, some part of which increases immensely in bulk, without forming a circumscribed tumour.

2. *Exostosis;* a circumscribed tumour of bony tissue, porous, or hard and dense as ivory.

3. *Enchondroma;* which is rare.

4. *The Fibro-plastic tumours* of Lebert, constituting, as he observes, tumours perhaps of the consistence of firm brain; often blotched with red, and very difficult to distinguish from cancer, except by microscopic examination. A specimen which the author recently saw extirpated by Professor Fergusson, and which had returned after a previous operation, was of the colour and consistence of kidney, and afforded most brilliant examples of the large many-nucleated mother-cells depicted at p. 99.

5. *Fibrous tumours* (*Osteo-sarcoma*); dense and homogeneous; containing bony spicula.

6. *Encysted tumours;* which, when situated within, or in front of the bone, have doubtless been more than once mistaken for enlarged antrum. Such tumours may contain glairy matter, and not seldom teeth, and probably consist of tooth capsules, unnaturally developed.

7. *Cancer* affects the upper jaw more frequently than it does any other bone, and constituted 10·35 cases of cancer of the bones collected by Lebert.

The *symptoms* of any one of these growths—which may be developed in the gums, periosteum, alveoli of the teeth, or in the cancellous substance of the bone, or in the antrum—are manifested by tumour bulging the cheek in front; which may increase, depress the roof of the mouth, and loosen the teeth; protrude into the nostril, and beneath the base of the skull into the pharynx; lift up the floor of the orbit and displace or compress the eye; and so, if allowed to remain, may render life odious by deformity, and at last put an end to it by interfering with breathing, or swallowing, or by compressing the brain.

The *diagnosis*, which is important, is between those growths of local character, which if thoroughly extirpated, do not return, and cancer. Slowness of growth; freedom from pain; an equable and firm consistence of the swelling; the skin moveable over it; ulceration of any projecting part within the mouth, if it exists, superficial, not fungating nor bleeding, nor yielding a copious, thin, fetid discharge; the tumour not affecting the general health, otherwise than by the inconvenience necessarily attached to its situation and bulk—these are the indications of a fibrous, or other non-cancerous growth. On the contrary, rapid growth, early cachexia, grinding pain, early loss of teeth, bleeding fungous growths projecting from their sockets, or into the nose or pharynx (where they may be felt by passing the fingers up behind the velum pendulum), and implication and adhesion of neighbouring parts, give the best grounds for pronouncing the growth cancerous.

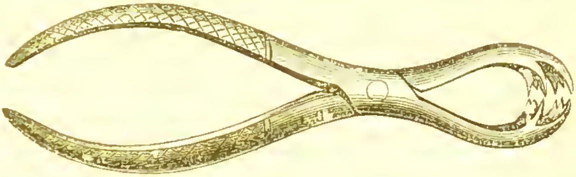
Treatment.—For all of these tumours, excepting decided and rapidly-growing cancers, extirpation as early as possible is the remedy. In cases of cysts, however, attached to the front of the bone, it suffices to lay them freely open, by removing their anterior wall.

The student who desires to understand, and the surgeon who proposes to execute, this operation, may naturally divide it into two parts; first, the incisions through the soft parts necessary for laying bare the tumour; and, secondly, the division of those processes of bone necessary for detaching it afterwards. The great experience of Mr. Fergusson has enabled him very materially to abridge the incisions through the soft parts. In the case of a very small tumour, it may be perfectly possible to remove it through the mouth; but if this opening be insufficient, Mr. Fergusson cuts through the upper lip exactly in the middle line, and carries the incision into the nostril. By thus availing himself of the natural expansion of the nostrils, he gains as much room as by a much larger incision from the angle of the mouth, and there is less bleeding at the time, and less deformity afterwards. If, however, the tumour requires more room for its removal, the incision just described must be carried up between the ala of the nose and the cheek, to within half an inch of the eye; probably another from the angle of the mouth to the zygoma; possibly another at right angles to this. After this the operator must dissect up the flap of the cheek, large or small, from the tumour, so as to lay it quite bare; and, in so doing, the infraorbital artery and nerve will probably be divided.

The next step of the operation consists in the division of the various attachments of the tumour, and in removing it. If circumscribed and seated in the front wall of the antrum, it may be sawn round and detached by forceps, without removing the alveoli; otherwise the surgeon begins by extracting an incisor on the one side, and a bicuspid or molar tooth on the other side of it, and by cutting through with his bistoury the gum and mucous membrane covering the bone at the parts where separation is to be effected. Perhaps he may turn the membrane back in flaps, so as to save as much as possible of the soft parts of the roof of the mouth. Then he cuts through the bone with curved bone forceps; or, if necessary, he grooves the bone above and on either side with small saws of various sizes and shapes, sawing quite through the alveolar processes, and completing the separation of the tumour with the cutting bone forceps.

But let us suppose that the tumour is large, and requires the removal of the body of the superior maxillary bone, but not the malar or floor of the orbit. If the student examines a skull, he will see that the bones which require to be divided are these:—viz., first, the horizontal palatine plates of the superior maxillary and palatine bones, with the alveoli corresponding to the incisor teeth. This (after the alveoli are sawn through) may be done with a saw, or by means of bone forceps, one blade being introduced into the nostrils, the other into the mouth. Secondly, the body of the superior maxilla must be sawed horizontally across just below the orbit, and the severance be completed as before by forceps; and lastly, the tumour must be grasped most firmly with a strong pair of clawed forceps used by Mr.

Fergusson (the Lion Forceps), and must be forcibly wrenched from its attachment to the pterygoid plates of the sphenoid; and so it may be removed.



Again, let us suppose that the entire bone is so implicated that the whole of it, including the floor of the orbit, must be extirpated; then, in addition to the division of the hard palate as before, the ascending nasal process must be cut through at the level of the orbit, and the malar bone likewise at its middle. If the malar bone requires to be removed as well, the zygoma, and the process which unites it with the frontal, must be divided. The contents of the orbit must be separated by careful dissection, and be held up with a bent spatula. When the processes of bone just mentioned have been cut through, the tumour must, as before, be forcibly moved, to separate it from the pterygoid and lachrymal bones, and dislodge it; the infraorbital nerve must be gently divided behind; in all cases the soft palate should be left untouched; and an incision carried along in front of it to the last molar tooth, should be made at the beginning of the proceedings. During the operation, the common carotid may be compressed, to prevent hæmorrhage. After it, the facial, and any other arteries that require it, are to be tied, the chasm to be filled with lint, and the wound closed with sutures.*

IV. FISSURE OF THE PALATE.—As the upper lip may be fissured through defective development, so also may the various parts constituting the hard and soft palate. In some cases the uvula merely is fissured; in others, the cleft extends forwards as far as the lips, and may be combined with a hare-lip. The fissure in the hard and soft palates is invariably in the mesial line, but when it extends forwards through the alveoli, it diverges somewhat to one side. In a few cases the fissure is double in front, so that it may, as a whole, be compared to the letter Y, the two lines in front having the pre-maxillary bones between them.

This affection, when extensive, necessarily causes very great difficulty in sucking and swallowing, and great risk of losing the child through starvation; if the child grows up, it causes a very serious impediment to distinct articulation.

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* See Fergusson's Practical Surgery, 3rd edit., p. 678; Liston on Tumours of the Face, Med. Chir. Trans., vol. xx.; Paget's Lectures, vol. ii.; Henry Smith, Med. Times, April 17, 1852; R. G. H. Butcher, Dublin Quarterly Journ. Med. Science, 1853.

Treatment.—When the fissure of the palate is combined with hare-lip, and the gap extends from back to front entirely through the hard and soft palate and lip, the lip should be operated upon soon after birth, in the manner described when we spoke of hare-lip; and the observations then made should be attended to, as to the saving and pushing together any projecting bone. During childhood, trusses should be worn to bring the edges of the bony fissure nearer together.

If, however, the fissure at birth should be discovered to be in the soft parts only (as shown in the next cut), the surgeon may adopt M. Cloquet's plan of cauterizing the angle of the fissure for a very limited extent, and allowing it to cicatrize; then repeating the operation again and again till the contraction following each cicatrization has closed the whole fissure. The cautery should be a small iron, at a black heat. M. Cloquet had tried this method upon four patients at the date of the publication of this paper, with success. The author is not aware that it has yet been adopted by any English surgeon, but hopes that this will soon be the case; as it will be a most important boon to patients if their malady can be relieved during infancy, before they have acquired a defective mode of speaking, and so if they can be spared the misery which this deformity and the usual operation inflict upon them.*—See *Cautery*, in Part v. chap iii.

The method heretofore adopted has been to leave the patient to attain the age of puberty, and then to perform the operation of *Staphyloraphy*, or suture of the uvula. This is always a difficult, and in former days anything but a successful, operation, owing in great measure to the difficulty of preventing the flaps, when united, from being dragged asunder by the muscles. Mr. W. Fergusson, who for the first time carefully examined and dissected the malformed parts, ascertained exactly what the forces and effects of the muscles really are, as follows:—

It had been often remarked that the action of the muscles upon the edges of the fissure in the soft palate was difficult of explanation. If the deformed part is examined whilst perfectly quiescent, the gap is seen conspicuously, the lateral flaps are distinct, and the posterior nares, with the upper end of the pharynx, are observed above and behind them. If now the flaps are touched, they will in all probability be jerked upwards; and if they be still further irritated, each flap will be still more forcibly drawn upwards and outwards, so as hardly to be distinguishable from the rest of the parts forming the sides of the nostrils and throat. But, on the other hand, if the pharynx be irritated, and made to perform the act of deglutition, the margins of the fissure will be brought together.

Now it is easy to understand both that the separation of the flaps must be produced by the action of the palatine muscles, and also that this must occasion a very serious impediment to any operation for uniting them by adhesion; but the muscular action *by which the flaps are brought together* was a mystery till Mr. Fergusson showed that it was caused by the upper semicircular border of the superior constrictor muscle of the pharynx; and to him is due the credit of proposing that the muscles which tend to separate the flaps should be neatly divided, and of showing what the muscles are, which really need to be divided, viz., the levator palati, and the palato-pharyngeus.

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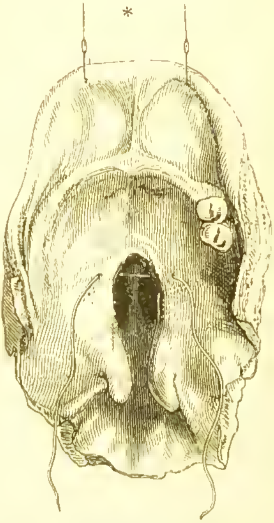
* See abstract of M. Cloquet's paper in Gaz. Med., March 3, 1855; Brit. and For. Med. Chir. Rev., July 1855; Ranking, Abstract, vol. xxi.

The operation is thus described by Mr. Fergusson:—"With a knife whose blade is somewhat like the point of a lancet, the cutting edge being about a quarter of an inch in extent, and the flat surface being bent semicircularly, I make an incision, about half an inch long, on each side of the posterior nares, a little above and parallel to the palatine flaps, and midway across a line straight downwards from the lower opening of the Eustachian tube, by which I divide the levator palati on both sides, just above its attachment to the palate.† Next I pare the edges of the fissure with a straight, blunt-pointed bistoury, removing little more than the mucous membrane; then, with a pair of long, blunt-pointed curved scissors, I divide the posterior pillars of the fauces, immediately behind the tonsil, and, if it seems necessary, cut across the anterior pillar too; the wound in each part being about a quarter of an inch in extent. Lastly, stitches are introduced by means of a curved needle set in a handle; and the threads being tied, so as to keep the cut edges of the fissure accurately in contact, the operation is completed."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The patient should be intelligent and quiet; and not under 12 or 14. Iced water for gargling, so as to check the bleeding, should be at hand. The parts must be well dissected from the hard palate, by which means all tension will be taken off, and the sides of the fissure will fall loosely together, and the stitches may be now applied. It is *highly important* that a sufficient number of stitches be introduced. The greatest strain will be generally at the anterior extremity of the fissure, where the soft parts are most firmly connected with the bones. The stitches are introduced by means of a curved needle set in a handle. "The point of the instrument, armed with a small smooth thread, is passed from below upwards about a quarter of an inch from the cut margin of the fissure, and made to appear in the middle of the gap, when the thread is seized with forceps, drawn three or four inches out of the mouth, and then the needle is withdrawn. A similar manœuvre is followed on the opposite side." Thus there is a double thread through each side of the fissure. One thread, C, is now pulled through; one end of it put into the loop of the other thread; when, by pulling A B, C will be drawn through the other side. This manœuvre, which is of great use in all plastic operations in deeply-seated parts, is ascribed to Mr. Avery. "Two, three, four, or five threads, of different colours for distinction' sake, are introduced in this way, and then, after the cut margins of the flaps are sponged free of blood and mucus, the various threads are fastened." The knot shown in the next cut is a good way of bringing the edges together; a double-reef knot, not too tight, so as to allow of swelling, will make all secure. After the operation has been finished, the patient must be kept perfectly quiet. It is better that the patient should not take anything for some hours after the operation until the parts have become somewhat quiet; but then bread soaked in milk, or in good beef-tea, which has some pounded meat mixed with it, should be given, so as to supply good plastic material. Enemata of beef-tea may be of service.

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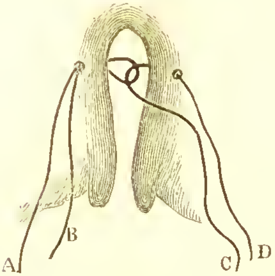
* From a preparation of Mr. Fergusson's in the King's College Museum.

† "If care be taken, in dividing the levator palati, not to run the knife towards the upper and back part of the pharynx, there is no harm to be dreaded from the incision above described. Were the instrument carried far upwards and backwards, the internal carotid would be in danger; but if its point be pushed straight outwards and forwards, it will sink into the pterygoid fossa, and possibly divide the tensor palati muscle, where it can come in contact with the external pterygoid process only."—Fergusson's Pract. Surg., 3rd edit., p. 612.



The surgeon need not be in any great hurry to remove the stitches. Mr. Fergusson, in his early operations, was in the habit of taking them away on the second day after the operation, but latterly he has permitted them to remain longer. "It is better, in my opinion, to let the threads remain several days too long than that they should be moved a minute too early. Usually I take one or two stitches away on the third or fourth day, and on the fifth or sixth remove them all. It is better, I think, to take them out at intervals than all at once."*

It must be remarked that many surgeons think the division of the muscles, in the above-described manner, not to offer any particular advantages over free lateral incisions, parallel with the edges of the cleft.

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* See Fergusson's Practical Surgery, Med. Chir. Trans., vol. xxviii.; Medical Times, Nos. 388 and 389; Lond. Journ. of Medicine, Jan. 1849; and some successful cases by Mr. Gay, Lancet, Feb. 19, 1853.

Fissure in the anterior part of the bony palate may be left, after the fissure in the soft parts behind has been closed. As we have before said, during growth, whilst the bones are pliable, the maxillary bones should be pressed together by means of a truss worn daily for some hours. At puberty, relief may be further attempted by means of an operation first proposed by Dr. J. M. Warren, of Boston. This consists in paring off the tissues from the bones on each side of the fissure, in two lateral flaps, and stitching these together in the middle line. The late Mr. Avery, whose patience and mechanical ingenuity admirably fitted him for operations of this nature, was very successful in closing fissures in the front of the palate, as the writer had opportunities of witnessing.

If no operation can be done successfully, the last resource is an *obturator*, or in plain English a plug, of gold or caoutchouc, to close the aperture. But this should not be used during growth, otherwise it will hinder any natural process of recovery; and if too large a plug be used, it will cause absorption of the palate, and make the evil worse.

V. TUMOURS OF THE LOWER JAW may be of any of the varieties which affect the upper jaw, but cancer is not so frequent. Their distinctive characters have been before detailed. Free extirpation is the remedy; and in this, as well as in the case of tumours of the upper jaw, Mr. Fergusson advises the incisions to be carried in such directions as shall cause the least subsequent deformity; and states his belief that any portion, or even the whole of the bone, may be taken away without cutting the margin of the lip; by which means the cicatrix will be less conspicuous, and bleeding from the labial artery will be saved. Mr. Syme adopts the same course. The incisions are carried along, parallel to the horizontal or ascending ramus, and are made so long that the tumour may be thoroughly exposed when the flap is raised. If the tumour is large, and situated near the middle of the bone, it must be laid bare as we have just described. A tooth must be extracted on each side of the tumour: next, the bone may be sawn half through perpendicularly on each side, and then be divided completely by the straight cutting forceps, one blade being passed up on the inner side of the bone, and the other placed in the groove made by the saw; and lastly, the parts attached to the inner side of the bone must be cautiously divided; namely, the digastric, mylo-hyoid, genio-hyoid, and genio-hyo-glossus muscles. When the attachments of these muscles are divided, care must be taken not to let the tongue retract into the throat, which might push back the epiglottis and cause suffocation. To prevent this, a ligature may be passed through the tip of the tongue, by which it may be held forwards during the operation, and which may be fastened to the twisted suture by which the wound is afterwards to be closed.

If, however, the disease is not so very extensive, it may not be necessary to sacrifice the whole thickness of the bone, but a horizontal portion of the base of the bone may be saved, which will prevent the chin from falling in after the operation. In order to effect this, the bone may be sawn downwards for half its depth on each side of the tumour, and a horizontal cut be made below it; and then the diseased portion be separated completely with the cutting pliers.

If a lateral portion is to be removed, an incision should be made along the basis of the bone, to its posterior angle, and up behind the ascending ramus. Thus a flap is formed, which may be turned up so as to furnish a good view of the tumour, and then the bone is to be divided as before described.

If the extent of the disease renders it necessary to remove the entire side of the bone, and to separate it from its articulation with the temporal, the operator must begin by making a curved incision from beneath the ear, along the basis of the jaw to the chin. The flap so formed is to be dissected up, and the masseter with it; an incisor tooth is to be removed, and the bone to be sawn vertically through; the end is next seized and depressed, and the temporal muscle dissected from the coronoid process; the pterygoid muscles and other internal attachments are then to be divided, and finally the ligaments of the joint. Whilst effecting the disarticulation of the condyle, the point of the knife should be kept close to the bone, so as to avoid all risk of wounding the external carotid artery. After bleeding has been restrained, the wound is to be closed by sutures, excepting at the middle, where an aperture should be left for the ligatures, and to permit the escape of discharge. The salivary ducts and facial nerves divided in these operations may be left to themselves; the muscular power of the face is usually recovered, and the saliva finds a channel into the mouth.*

VI. NECROSIS of portions of the jaws is occasionally the result of mechanical violence, carious teeth, or violent salivation; but of late years a new source of this disease has been detected in *phosphorus*. This when imbibed by persons employed in lucifer-match manufactories, especially if they have carious teeth, may cause inflammation of the periosteum, with thickening and infiltration, followed by inflammation and abscess, and resulting in necrosis of a portion of bone with extensive sloughing of the soft parts around. The health is much broken down; the discharge particularly fetid and copious. "With loss of appetite, sallow countenance, and feeble circulation," says Mr. Stanley, "the first indication of the disease is usually toothache, followed by the dropping out of the teeth, more especially of the grinders, and then by the death of a portion of the jaw." There is no reparation subsequently as in common necrosis.

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* See Liston's Elements of Surgery, and Practical Surgery, 2nd edition; Guthrie, in Med. Gaz., vol. xvii.; Brodie, ibid., vol. xv.; Liston on Tumours of the Face, in Med. Chir. Trans., vol. xx.; Bell on the Teeth; Jobson on the Teeth; and Fergusson's Practical Surgery. Diseases of the lower jaw requiring amputation have been caused by a projection anteriorly of the coronoid process, which hindered the evolution of the wisdom tooth.—Forbes's Rev., vol. viii.

Treatment.—In the earliest stage, free incisions through the gums and thickened periosteum; when necrosis has taken place, deodorizing lotions copiously applied; meat beaten to a pulp, and other nourishing food; loose portions to be removed as soon as detached.*

VII. CLOSURE OF THE JAWS, with more or less inability to open the mouth and to masticate solid food, may be a result of disease of the bone implicating the joint; or of rigid cicatrices within the mouth, produced after sloughing, whether caused by drinking boiling water, or by the profuse administration of mercury. The division of any rigid bands of cicatrices, the division of the masseter muscles by subcutaneous section, a narrow knife being thrust from the mouth between the muscle and the skin, an operation which has been successfully performed by Mr. Fergusson, and the use of a screw dilator, are the only available remedies.

SECTION IV.—AFFECTIONS OF THE MOUTH AND TONGUE.

1. TUMOURS of almost every kind, including cartilaginous, glandular, vascular, and serocystic, may be found in the cheeks, but the commonest are encysted tumours, containing a glairy liquid. They may project on the inner surface of the lips, or may exist under the tongue, where such tumours are known by the term *ranula.* It was formerly supposed that ranula depended on obstruction of the Whartonian salivary duct; but this is not the case. These tumours should be treated in the first place by simple free incision, or by cutting out a piece of the sac. Should this not suffice, the interior may be touched with lunar caustic, or a small seton be passed through it, to cause it to suppurate and waste away; or the cyst, if loosely attached, may be dissected out.

When ranula has existed long, it may increase greatly and form a tumour of very considerable size, pushing the tongue over to the other side, or up to the roof of the mouth, interfering very seriously with speech, deglutition, and even respiration, not allowing the mouth to be closed, projecting under the jaw, and even, as in a case related by Mr. Mayo, of Winchester, reaching down between the sterno-mastoid muscle and trachea to the clavicle. The contents of such cysts become mortar-like, or almost solid, and the cysts themselves thickened and closely adherent to the surrounding parts, so as not to be detached without great bleeding. In any such case, if the tumour is too large to be extirpated, or its contents too solid to be removed by an incision within the mouth, an incision must be made in the middle line beneath the jaw, between the muscles which pass from the jaw to the hyoid bone; or wherever else it is most superficial. The contents must be removed; as much of the cyst as can be detached, be cut off; and the remainder left to suppurate. Mr. Mayo fills the remainder of the cyst with lint dipped in turpentine, both to check bleeding and to cause the cyst to be quickly thrown off.*

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* See Stanley on the Bones, and a Lecture by Mr. Simon, Lancet, 12th Jan. 1850.

II. TONGUE-TIE signifies a prolongation of the frænum linguæ, confining the apex of the organ to the lower jaw. It is usually detected by the difficulty which the infant has in sucking; and may easily be relieved by dividing the frænum with a blunt-pointed pair of scissors, taking care to direct their points downwards, and to keep as close to the lower jaw as possible, so as to avoid the lingual artery.

III. WOUNDS of the tongue are liable to be attended with severe hæmorrhage from the lingual artery or from veins. If the bleeding orifice cannot be otherwise tied, one or more ligatures must be introduced with curved needles, so as to include and constrict the bleeding parts, or a heated iron may be applied. Children are apt to inflict very severe bites, even sometimes almost biting off the end of the tongue. The author has treated several such by leaving them entirely to nature. He has known surgeons put themselves to very great trouble to introduce sutures, but the patient fared none the better.

IV. INFLAMMATION of the tongue, known by great swelling, tenderness, and difficulty of speaking, and of deglutition; generally accompanies severe salivation; but it may occur in an acute form independently of this cause. It must be treated by purgatives and gargles; by leeches, incisions, and the antiphlogistic regimen generally, if necessary. If abscess form, the fluctuating part should be opened. Abscesses which form under the tongue may cause suffocation by their pressure on the glottis: an incision beneath the chin, through the mylohyoid muscle is the only resource.†

V. HYPERTROPHY.—Enlargement, without tenderness or structural disease, sometimes affects the tongue, causing it to protrude permanently from the mouth. It is usually the result of an attack of acute inflammation, which has caused the tongue to protrude. On this point the author believes the following case will supply a practical hint. He was some time since consulted in a case in which the tongue had protruded largely from the mouth, in consequence of severe salivation. He found that the continuance of the protrusion was owing, first, to the impaired function of the recently-inflamed organ; and, secondly, to some amount of constriction by the teeth; but gentle pressure easily caused it gradually to return into the mouth. Had it been left to itself it might, to all appearance, have remained protruded for ever. Hence, in all such cases, the surgeon should replace the tongue, so soon as the acutest stage of inflammation has passed, and should not wait for it to go in of itself.

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* Mr. Mayo's case, Lancet, 1847, i. 667; also Fergusson's Pract. Surg., 3rd edit., p. 599.

† Sometimes the tongue enlarges suddenly to an immense size, so as almost to cause suffocation, but without any symptoms of inflammation, properly so called. A case which proved fatal, in spite of bleeding, leeching, calomel, and incisions, is related by Mr. Lyford, of Winchester, in the Lancet for 1828, p. 16; a similar case, cured by purgatives and incision, by Mr. Taynton, Med. Gaz., vol. xii., who speaks of it as the only case he had seen in a practice of forty years; and one by Mr. Collins (ib., p. 642), in a pregnant woman, cured by an incision in the raphé on the under surface.

Treatment.—Steady compression should be first tried, by compress and bandage. Should this fail, a Λ-shaped piece should be removed, and the cut surfaces be brought together by suture. If the surgeon has reason to fear bleeding, he may pass a needle armed with a strong double ligature through the centre of the tongue, and then tie one thread very tightly round each half.

VI. ULCERATION of the tongue presents many varieties. One of the commonest is that which arises from the irritation of decayed teeth, and is usually soon cured by removing the cause, and using aperients and an astringent gargle. A more troublesome sort begins with aphthous spots on the tongue or any other part of the inside of the mouth, which produce excessively irritable and tedious ulcers in succession. Aperients and tonics, and the application of nitrate of silver, or lin. æruginis are the remedies. Secondary and tertiary syphilis are also liable to cause ulcers here; which are to be recognized by the history of the patient, and by the benefit probably derivable from sarsaparilla with iodide of potassium.

VII. CANCER of the tongue usually soon produces a deep excavated ulcer, which will be distinguished from either of the simpler kinds by its having been preceded by nodular enlargement, and by pain and embarrassment in the use of the organ. In the case of the late Bransby Cooper, neuralgia of the right side of the neck and face was the first symptom; followed by difficulty of swallowing and articulation, fetid breath, and loss of flesh. Death occurred from arterial hæmorrhage in ten months. There was found a deep excavation at the root of the tongue; the tissues around, as well as the muscles about the os hyoides and some adjoining lymphatic glands, infiltrated with cancer.

VIII. EPITHELIOMA of the tongue may be scarcely less fatal than cancer, from which it may be difficult to distinguish it except by microscopical examination. A typical case of it occurred in the person of the late Professor John Reid, of St. Andrew's. His age was 39, and health good. In December 1847, he noticed a small ulcer on the right side of the tongue; it slowly extended and acquired hard everted edges, but caused little inconvenience. In July 1848, it had attained the size of a five-shilling piece; its surface and edge were ragged, and it caused considerable pain, especially at night. A hard ridge could be felt all round the ulcer, and glands enlarged beneath the jaw. The health, by the end of August, had completely given way from the pain, when the diseased part of the tongue was excised by Mr. Fergusson. In less than a month the wound had healed, and the health was re-established. In November the enlarged glands were removed by Dr. Duncan. The disease returned in the cicatrices of the wounds, and spread chiefly in the upper part of the neck. Death occurred in July 1849. The diseased part of the tongue and the gland, which were excised, were infiltrated with epithelium. Paget observes, however, that a collection of epithelium may form deep in the tissues of this organ, without any primary changes of its surface.

Treatment.—In any such cases, and in the case of any ulcer, when the failure of all treatment gives room for suspicion, free and early extirpation should be performed. Hæmorrhage that cannot be checked by gargling with cold water, or zinc or creosote lotion, may be restrained by actual cautery. If near the tip, the parts should be seized with forceps and cut off; if further back, strangulation by ligature may cause less risk of hæmorrhage. Portions of the tongue have been exposed by incision beneath the jaw, by Mr. Arnott and others, and then strangulated.* Amongst palliative measures the application of ice may be found useful.

The cases of these two eminent members of the profession present a subject for useful comparison. The epithelioma was here quite as *malignant* as the cancer. Yet diseases, though equally fatal, should not be confounded, if their anatomical elements are distinct.

SECTION V.—AFFECTIONS OF THE TEETH AND GUMS.

I. LANCING OF THE GUMS of children may be performed for two reasons. If the gum is swelled, inflamed, and tender, whether or not a tooth be quite ready to come through, a free incision may be made with a fine lancet, for the purpose of letting blood flow. But if it is tightly stretched over a tooth, which is bursting through, the incision should be carried down to and all along the tooth, so as to release it entirely.

II. IRREGULARITY OF THE PERMANENT TEETH is a consequence of contracted and ill-formed jawbones. If either of the canine teeth or of the incisors of either jaw project much, the patient should be taught perpetually to endeavour to push it back into its proper position with his fingers. But if at the age of fourteen or fifteen this method has not succeeded, and the teeth are much crowded, the projecting tooth may be removed, although in many cases it is better to sacrifice one of the bicuspides to make room for it. If a growing child is *underhung*, so that the under incisors come in front of the upper ones when the mouth is shut, or so that the teeth meet at the cutting edges, instead of the lower teeth being received within the upper, the child should be encouraged daily to push the upper teeth forwards with its tongue and fingers: and should frequently put the end of a spoon-handle behind the upper incisors, and then close the mouth, using the spoon as a lever to press the upper teeth forwards and the lower ones backwards. But if these simple means do not succeed, recourse should be had to the appliances used by professional dentists.*

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* For Dr. Reid's case, see Hughes Bennett on Cancer, &c.; Arnott, Med. Chir. Trans., vol. xxii. The author has to thank Mr. Birkett and Mr. Avery for some particulars of Mr. Cooper's case.

The *wisdom teeth*, especially in the lower jaw, are extremely liable to be misplaced, growing directly outwards or inwards, and producing ulceration of the cheek or tongue; or projecting forwards against the neighbouring molar, or backwards into the coronoid process, or even being contained within a tumour in the substance of that process. Tumours of either jaw may likewise arise from mal-development of either of the other teeth.

III. Fracture and Dislocation of Teeth.—If a portion of a tooth is broken off, without exposing the pulp cavity, the exposed surface should be filed smooth, and then no inconvenience will probably follow. If it is snapped off at the neck, and the pulp cavity is exposed and very painful, it should be touched with lunar caustic, and the mouth be frequently bathed with strong poppy decoction; and when pain and tenderness have ceased, an artificial tooth may be fastened by a pivot to the stump. If, however, the root of the tooth is loosened, it had better be extracted at once. If a tooth is loosened by a blow, it should be fastened by silk to its neighbours. If a tooth is entirely driven out, it should be replaced as soon as bleeding has ceased, and be fastened in by silk; no food should be allowed that requires mastication, and inflammation should be combated by repeatedly leeching the gum.

IV. Caries of Teeth signifies a successive softening and decay, gradually spreading till it reaches the central cavity of the tooth, which from that time is subject to fits of toothache. It depends on original imperfect formation of the enamel and bone, especially in scrofulous and ill-nurtured persons, and may further be promoted by any circumstances which lower the general health. It is very frequently a consequence of pregnancy, and of nursing; it may follow any serious illness, or loss of strength, or the abuse of mercury. It is rank nonsense to allege (as ill-educated dentists do) that it may be caused by steel or acids used as tonics, or by any abrasion or loss of enamel. It is as truly a constitutional disease as phthisis or scrofula. The author has seen the four upper incisors quite rotten in a scrofulous child at thirteen months.

Treatment.—If the caries be slight and recent, the whole of the decayed portion should be removed by proper instruments, and the cavity be filled up with gold, or an amalgam of silver and mercury. But if the decay has advanced far towards the pulp cavity, or has laid that open, it may be necessary first to employ aperients and tonics, and use some applications to deaden the sensibility of the tooth, so as to enable it to bear the stopping, and to protect it meanwhile from contact with food and saliva For these purposes the best plan is, to fill the cavity with a bit of cotton wool, dipped in a solution of mastic, in Eau de Cologne, or in alcohol, or in solution of gutta percha in chloroform: vide F. 183. By these means the tooth may very probably be brought into a state to bear stopping with gold. The patient should avoid exposure to cold, errors in diet, and drinking very hot, or cold, or sweet, or acid fluids.

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* A good account of which will be found in Tomes's Lectures on Dental Surgery.

There is a prejudice amongst dentists against extracting any of the first set of teeth in children, however carious; on the supposition that the jaw might become contracted, and the permanent teeth crowded in consequence. Mr. Tomes tells the author that this fear is groundless. These teeth certainly should not be extracted needlessly: but it is better to do so than to allow them to cause much pain, or gum-boils; or to cause the child to bolt his food from the pain of chewing it.

Every case in which teeth decay with rapidity, should be looked upon as requiring medical treatment; and in particular the administration of cod-liver oil, steel, bone-dust, &c.: F. 201.

V. TOOTHACHE.—When the cavity of a tooth has been laid bare by caries, the delicate nervous pulp contained in it, is extremely liable to pain from contact with the liquids of the mouth; and if the health be at all out of order, or if it be much irritated, it is liable to acute inflammation, with most agonizing toothache.

Treatment.—We believe the best treatment for this kind of toothache to be as follows: let the patient have a dose of calomel and colocynth; confine him to spoon diet; let him wash out the mouth with a solution of carbonate of soda in water; let the gum around the tooth, and between it and its neighbours, if tumid, or tender, be deeply scarified with a fine lancet; then let the cavity be filled loosely with a little bit of cotton dipped into the solution of tannin and mastic, F. 183; and if the toothache is curable at all, this plan, with a little patience, will be almost sure to succeed. If the pain is very violent, half a grain of powdered acetate of morphia may be taken up with the cotton imbued with the tannin; which should be warmed before it is put into the cavity. In some few cases, a whiff of chloroform will lull the pain. As soon as the pain is relieved, the tooth, if of use, should be stopped with gold or amalgam; if of no use, it should be extracted.

Other remedies occasionally of service are, *warm poultices* to the cheek; *sialagogues*, especially a little piece of pellitory chewed; *anodynes*, especially warm poppy decoction held in the mouth; or a full opiate at bed-time, if the bowels have been well cleared: *stimulant*, escharotic and astringent substances introduced into the cavity of the tooth, such as a drop of strong solution of nitrate of silver, or solution of alum or of tannin; respecting which last substance the author is most grateful to acknowledge the benefit he has derived from it, since it was introduced by his friend Mr. Tomes. It may be added, that most of the violent, burning, empirical nostrums, such as creosote, oil of thyme, &c., although they may be of service when introduced in small quantity by a skilful hand into the carious tooth, at the right time, yet that when employed indiscriminately, as they are by the vulgar, they can do nothing but mischief.

It may be remarked that the gum in the interstice between a decayed tooth and its neighbour, often becomes spongy, and swelled, and excessively sensitive; giving rise to a very wearing kind of toothache; and causing excruciating pain if a portion of the food happens to be pressed down upon it. This may be relieved by a deep incision through the swollen gum, and the use of tannin gargle, of pellitory chewed, and of such aperients, F. 34, 35, as tend to unload a congested mucous membrane.

VI. INFLAMMATION of the *central pulp* sometimes affects a tooth that is apparently sound. It occasions severe, heavy throbbing pain extending to the head, and considerable tenderness of the tooth and of the gum around. It may lead to suppuration of the pulp, or to abscess in the alveolus, and death of the tooth in consequence.

Treatment.—Leeches, low diet, and purgatives.

VII. When a tooth is partially decayed, it very frequently causes *inflammation of the* PERIOSTEUM *of its socket*, which swells and so causes the tooth to feel looser and longer than natural. The gum around the neck of the tooth is generally highly vascular. This state of things often ends in a *gum-boil* or *alveolar abscess*. A leech, or a deep incision in the gum between the diseased tooth and its neighbours, and fomentations of poppy to the interior of the mouth, are the remedies.

VIII. NEURALGIC toothache, whether it occurs in teeth that are entirely sound, or partially carious, is to be distinguished by its occurring in paroxysms which come and go suddenly, in more or less regular intervals. It is very common in the earlier months of pregnancy.

Treatment.—Quinine in large doses, together with aperients and alteratives, are the most successful remedies.

IX. *Toothache* sometimes has the characters of chronic RHEUMATISM; flying about the jaw, affecting no tooth in particular, and not relieved by extraction, so much as by blue pill and aperients, with small doses of colchicum.

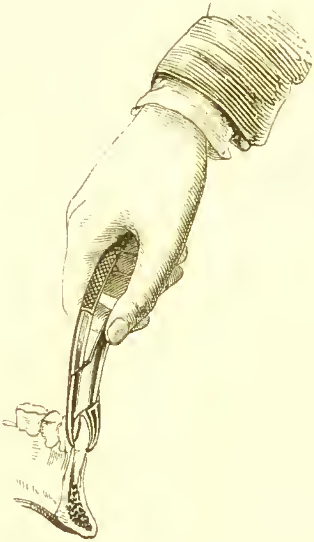
The muriate of ammonia, in half-drachm doses, every four hours, dissolved in water, and the iodide of potassium, deserve a trial in these and other obstinate cases of toothache.*

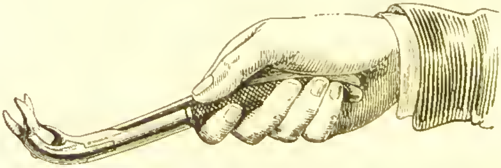
X. It sometimes happens that the fang of a tooth is thickened by a deposit of bone; in which case the tooth becomes affected with severe pain that can hardly be distinguished from that of neuralgia. It sometimes occurs on teeth that are perfectly sound, but more generally on carious teeth, or stumps. The excessive pain of this affection is in general only to be relieved by extraction.

* Vide Dr. Watson's Lectures, Lect. 39.

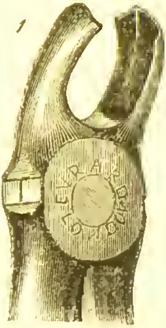
XI. NECROSIS OF TEETH.—A tooth is said to be necrosed when it has become black and unsightly, and loose in its socket. This affection may be caused by blows which have torn across the nutrient vessels, or by inflammation of the pulp (perhaps from the abuse of mercury.) Extraction must be performed, if the tooth cause inflammation or other inconvenience.

XII. EXTRACTION OF TEETH.—Nothing which relieves human suffering ought to be slighted or despised. No wise surgeon therefore will fail to make himself acquainted with the way of pulling out teeth with dexterity. It is an operation which is easily performed by any one who has the proper instruments, and uses them with ordinary care; and it is one which if unskilfully or carelessly performed may lead to very serious results, to say nothing of the suffering which it inflicts. We beg the reader, therefore, to study well the construction of the instruments employed, and to practise with them on the dead body, before he tries his hand on the living. They are the forceps, the elevator, and the key.





1. *The forceps* is the instrument that is now generally employed by dentists. It should be made with sharp edges, so that it may be pushed up between the tooth and the gum, and should seize the tooth by its neck, close to the alveolus. For this purpose, also, the jaws of the instrument should be made to incline towards each other in such a way, that they may slip up and embrace the neck of the tooth accurately when the handles are pressed together; and they should be ground in such a manner that they may be adapted accurately to the shape of each tooth. For this purpose the surgeon will require seven sets of instruments. One instrument is required for the left upper molar (fig. 1), and one for the right (fig. 2), because of the peculiar conformation of those teeth. One will serve for the lower molars of either side (fig. 3); one will serve for any single-fanged tooth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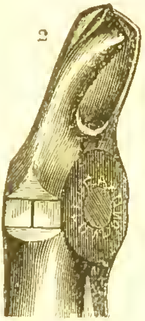
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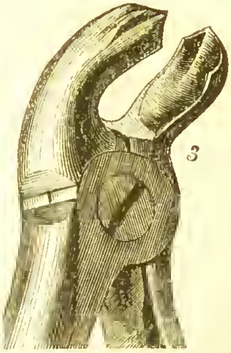
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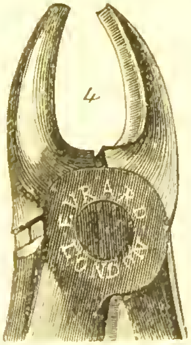
of the upper jaw (fig. 4), and one for any single-fanged tooth of the lower jaw (fig. 5.) Stumps in the upper jaw may be extracted with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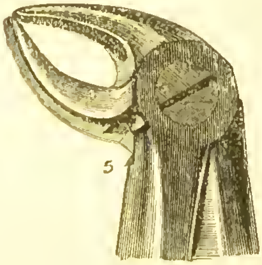
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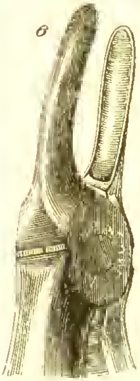
the instrument fig. 6, and those in the lower jaw with fig. 7. The instruments here depicted were devised by Mr. Tomes some years since, and are made by Evrard, who lives opposite the Middlesex Hospital.



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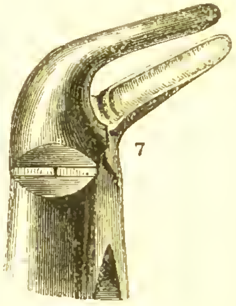

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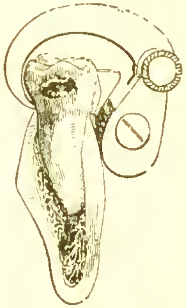
In extracting teeth by the forceps, there are two things to be done; first, to loosen the tooth, and then to pull it straight out. In extracting the incisors and canines of the upper jaw, they may first be loosened by giving them a gentle twist, combined with a slight rocking motion, and then may be pulled perpendicularly downwards with a slight inclination backwards. The incisors and canines of the lower jaw are to be loosened by giving them a firm but gentle motion backwards and forwards, and then may be pulled straight up. The bicuspides and molars are to be loosened by moving them from side to side, so as to make the alveolar process yield a little, and then they may be pulled perpendicularly, upwards or downwards, as the case may be. The operator should grasp the forceps firmly, in such a manner that it may move altogether with his hand; but yet not so forcibly as to run the risk of crushing the tooth.

2. *The elevator* is highly useful for stumps, and for old straggling teeth. The point is to be thrust firmly down between the tooth and its socket, and then by bringing the instrument into a horizontal position, and making a fulcrum of the edge of the alveolar process, or of the adjoining tooth, or of the operator's fingers, the tooth may be lifted out.

2. *The key* is an instrument that is often employed for the extraction of the bicuspides and molars; but it is more painful than the forceps, and every one must know instances of laceration of the gum, and splintering of the alveoli, followed, perhaps, by tedious exfoliation, that have been produced by the clumsy use of this instrument; not to mention the risk of the claw slipping from the decayed tooth and dragging out a sound one instead. If, however, it is pre-

ferred, care should be taken to select an instrument of proper size, and to place the fulcrum in a proper position. If the key is too small, and the fulcrum too high, very probably the crown of the tooth will be snapped off. If the key is too large, and the fulcrum too low, either the claw of the instrument may be snapped across, or the alveolar process be extensively splintered. The adjoining figure is intended to show the right position, which will draw the tooth more or less perpendicularly from its socket. The fulcrum ought to be placed on the *inner* side, for the bicuspides of the lower jaw, and molars of the upper; and on the outer side for the molars of the lower jaw. The *dentes sapientiæ* of the upper jaw should never, according to Bell, be extracted with the key, because of the delicate texture of the bone on which the fulcrum must rest.



Before extracting teeth with the key, it is usual to cut away the gum from their necks by means of a gum lancet; a practice which some authorities consider unnecessary. It certainly is unnecessary in the majority of cases, especially for the extraction of the temporary teeth, and of the teeth of old persons which have separated from the gum, and become loose in their sockets; yet it may be performed either if the gum has been subject to repeated inflammation, which renders it adherent to the tooth, and liable to be lacerated on its removal; or secondly, in order to afford room for the claw, if the tooth has decayed down to the gum. Some persons, instead of using a lancet, separate the gum by means of a small tenaculum.

XIII. HÆMORRHAGE *after Extraction of Teeth.*—This operation may be followed by very severe and dangerous hæmorrhage, which sometimes appears to come from the dental artery at the bottom of the socket; sometimes from the gums, when they have been long diseased. The cavity must first be cleared of all coagulum; then a piece of *matico* leaf, or a little strip of lint loaded with powdered matico; or a bit of nitrate of silver may be put into the socket; but if neither of these remedies succeeds, the alveolus must be plugged in the following way: It is first to be cleansed from coagulum; then one end of a long thin strip of lint is to be firmly pressed into it, so as to come into contact with its very bottom, and the remainder in successive portions is to be forced in till the socket is filled up to the level of the gum. A compress should then be placed on the part, thick enough to be pressed upon by the antagonist teeth, and the mouth should be kept firmly closed by a bandage passing from under the chin to the vertex.

XIV. TARTAR, or *salivary calculus*, is an earthy matter deposited on the teeth from the saliva. It is found most abundantly on the superior molars and inferior incisors, obviously because those teeth are nearest the orifices of the salivary ducts. If suffered to accumulate, it causes inflammation and absorption of the gums, and gradual loosening of the teeth.

Treatment.—The deposit of this substance is to be prevented by taking care not to disorder the stomach, and by the strictest cleanliness. The teeth should be cleaned at least twice a day, with a soft tooth-powder (precipitated chalk is the best) and a little soap. The hairs of the tooth-brush should be soft, and not too closely set; so that they may penetrate the better into the interstices of the teeth. When any quantity of the tartar has accumulated, it should be removed by the *scaling instruments.* The edge or point of the instrument is to be introduced between the concretion and the gum, so as to detach the former in flakes; in the meanwhile a finger or thumb, guarded with a towel, should be pressed firmly on the cutting edges of the teeth, so that they may not be loosened by the force necessarily employed. Sometimes a small portion of this substance is found sticking in the orifice of one of the salivary ducts, and creating great discomfort by its irritation. It may easily be removed.

XV. INFLAMMATORY SOFTENING AND ABSORPTION, vulgarly called *scurvy* of the gums, generally affects middle-aged or elderly people, and may be a consequence of the accumulation of tartar, but more frequently depends on a congested state of the liver and bowels. The gums are swollen, spongy, exceedingly tender, and subject to constant aching pain, and they bleed on the slightest touch. If the disease proceeds, they separate from the teeth; the alveoli gradually become absorbed, and the teeth loosen, and at last fall out. These consequences are sometimes speedy, and are attended with suppuration in the alveoli; but more frequently they are slow, the teeth dropping out one by one in the course of years.

Treatment.—The gums should be unloaded by deep and free scarifications and repeated leechings; the bowels should be well cleared by a course of purgatives; and gargles should be employed to correct the secretions of the mouth, and excite the vessels to contract. Whilst there is much pain and soreness, the soothing gargle, F. 113. Subsequently, recourse may be had to F. 109, 111, &c.

XVI. GUM-BOIL (*alveolar abscess, parúlis*) is a small abscess commencing in the socket of a tooth, and bursting through the gum, or sometimes through the cheek. It is usually caused by the irritation of a dead or carious tooth. In neglected cases, extensive exfoliation of the bone may follow.

Treatment.—Fomentations; removal of the tooth, if much decayed; and an incision as soon as matter can be detected. If the tooth is extracted soon, the sac of the abscess very often comes away with it.

XVII. EPŪLIS signifies a fibro-plastic or fibrous tumour of the gum. It generally commences between two teeth, which it gradually separates, then loosens, and finally displaces, and may spread so as to involve several of them. Or it may begin on the free surface of the gum, internal or external, and may form a tumour flat, prominent, polypous, or pendulous. This tumour is indolent, painless, and of slow growth; but it ought always to be extirpated without delay, because it is liable to increase, and might become the seat of offensive ulceration, to say nothing of the deformity and inconvenience which it occasions.

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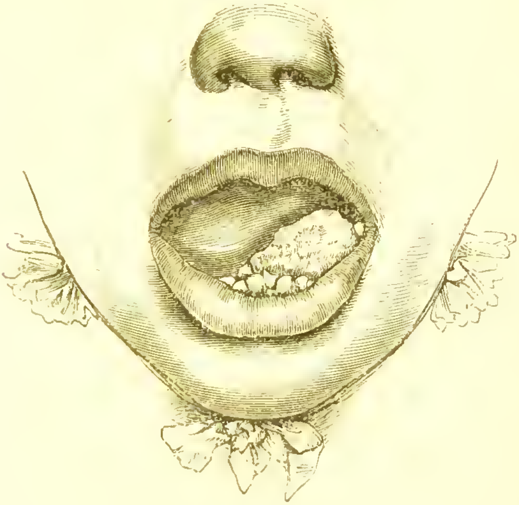

If possible, it must be cleanly shaved from the periosteum; but if necessary, the tooth on either side must be extracted, and the tumour entirely cut out. A portion of the alveolar process must be removed likewise, if necessary, in order to render the extirpation complete.

A similar tumour is sometimes formed when a dead portion of the root of a tooth remains in its socket, and the gum has healed over it. The tumour should be entirely removed with the knife, and the extraneous body should be sought for, and be extracted, if possible.

Cancerous tumours of the gums are exceedingly rare; they will, however, be recognised by their rapid growth, and tendency to hæmorrhage.

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* This cut represents an epulis, in a patient of Mr. H. Walton's; it had existed many years, and interfered with the movements of the tongue and use of the jaws, and so produced great emaciation.

CHAPTER XV.

SURGICAL DISEASES AND INJURIES OF THE NECK.

SECTION I.—SURGICAL DISEASES OF THE FAUCES, TONSILS, AND UVULA.

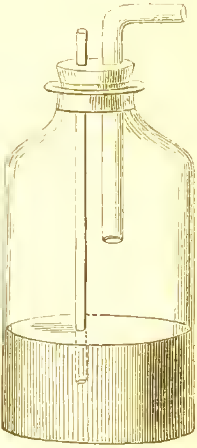
I. ACUTE TONSILLITIS, QUINSY, or INFLAMMATION OF THE TONSIL, is known by rapid swelling of the part, considerable throbbing pain; deglutition difficult, perhaps impossible; headache, foul tongue, and fever. It must be treated by leeches, poultices, a dose of calomel followed by purgatives, inhalation of the steam of boiling water, gargles calculated to promote the secretion of saliva (F. 107), and the ordinary antiphlogistic routine. If the gland continue to swell, or if it occasion any embarrassment to the breathing, an incision should be made into it to unload the vessels, and give exit to matter. The tongue should be kept down with one forefinger, whilst a straight bistoury, wrapped round with lint except an inch and a half of its point, is plunged directly into the tumour, and made to cut its way out towards the median line. Abscesses behind the pharynx require similar treatment.

II. CHRONIC ENLARGEMENT OF THE TONSIL is a frequent sequel of inflammation, especially of reiterated catarrh in scrofulous children. It causes sundry inconveniences. The parts are liable to frequent attacks of acute inflammation; deglutition is impeded; the voice is rendered hoarse; respiration is noisy and laborious, especially during sleep; the diseased state of mucous membrane is extremely liable to be continued into the ear, as we explained when treating of throat deafness, and to lead to disorganization of the delicate structures in the tympanal cavity; and suffocation has even been caused by viscid mucus entangled between the swollen glands.

Treatment.—In the first place the system must be strengthened, and the secretions be kept up by proper tonics and alteratives. Steel, especially the iodide, bark, cod-liver oil, or F. 87, 65, 41, 37, &c., may be administered with benefit. At the same time contraction must be promoted by astringent gargles, F. 109, by swabbing the throat once a day with a lotion of arg. nit. ℈j, aq. dest. ℥j, or liq. iodinii, and by applying stimulating or ioduretted liniments to the skin.

The method of *swabbing* is simple. A piece of sponge the size of a walnut must be put over the end of a stick, cane, or whalebone, in such a way that it completely covers the end of the stick; and it must be firmly sewn or fastened on. The patient sitting, opens his mouth, and the surgeon having made the sponge to imbibe a solution of nitrate of silver, presses down the tongue with the left forefinger, introduces the sponge into the pharynx, and fairly swabs out every part of it.

Inhalation of vapour is another remedy of the greatest possible efficacy when the mucous membrane of the fauces, mouth, and tonsils is flabby and swollen; as well as in the catarrhal rhinorrhœa, in throat deafness, and in coughs attended with copious expectoration. In order to inhale effectually it is necessary to have some apparatus; and the essence of all such apparatus is, that they have one passage for introducing the external air below the surface of the liquid whose vapour is employed; another through which the patient can draw the air mixed with vapour into his mouth. The cheapest and most efficient inhaler the author is acquainted with is a simple double tube with mouthpiece, sold by G. Mawe, of Aldersgate Street. But, for the sake of the poor, he recommends one to be made thus:—Take any large stone or glass bottle with a wide mouth, and a soft cork; take two pieces of German glass tubing; bend the shorter one at an angle to serve as mouthpiece; put the ends into a gas flame, to melt off any sharp edges; bore the cork, by means of a rat's-tail file, with two holes for the tubes to pass through; put the necessary liquid into the bottle; insert the cork with the tubes, and the machine is ready for use. The most efficient vapours are evolved from boiling water, to which twenty drops of creosote, or the same of tincture of iodine, have been added. Mr. Harvey tells the author that he sometimes adds tincture of guaiacum.



If these measures fail, and such an operation is deemed necessary, part of the gland should be removed with the knife—a much more expeditious and cleanly method than the ligature. The surgeon seizes the tumour with a hook or forceps (depressing the tongue with its handle), then introduces a blunt-pointed curved bistoury, and shaves a thin slice off, cutting upwards, parallel to the isthmus faucium. The nearest half of the blade of the bistoury should be wrapped in lint, to prevent the lips from being cut; and in operating on the right side, the surgeon will find it most convenient to cross his hands, the left, holding the forceps, being undermost. Very little should be removed; not only to avoid hæmorrhage, but likewise because of the possible truth of Mr. Harvey's theory that removal of the tonsils interferes with the development of the genital organs. There are certain *guillotine* instruments which can also be very adroitly used for this purpose. Specimens of excised tonsils which the author has examined have been infiltrated with cells, most of them exactly resembling pus.

III. ENLARGEMENT OF THE UVULA produces tickling cough and expectoration by irritating the larynx. If it does not yield to the treatment directed for enlarged tonsil, it should be stretched and steadied with a forceps, and be cut through in the middle with a pair of long scissors.

Our design being to describe such affections only of these parts as require surgical remedies, we must pass over the various other sorts of sore throat, which are assigned to the physician; merely remarking that the affection which we have described as *quinsy*, is phlegmonous and deep, yet that the superficial and catarrhal inflammations require nearly similar treatment.

SECTION II.—SURGICAL AFFECTIONS OF THE PHARYNX AND ŒSOPHAGUS.

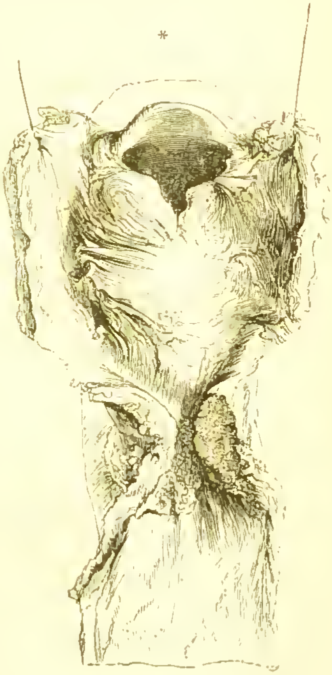
I. SPASM OF THE ŒSOPHAGUS (*spasmodic stricture*) is known by its generally occurring in sudden fits—the patient at a meal finding himself altogether incapable of swallowing, and the attempt to do so producing spasmodic pain and a sense of choking. The *diagnosis* between this and the *organic* or *permanent stricture* is founded on the suddenness of its accession: it being much better at some times than at others; and the fact that the bougie, if passed, either meets with no obstruction, or with one that very easily yields.

Treatment.—This affection always depends on a weakened or hysterical state of the system, or on the presence of some other disorder, as has been mentioned whilst treating of neuralgia. Brodie relates a case that ceased on the removal of bleeding piles; and Mayo another that was cured by relieving chronic disease of the liver. Tonics, antispasmodics, and alteratives, especially iron with aloes and galbanum at bedtime; exercise in the open air; the shower-bath, and other forms of warm and cold bathing; great attention to the diet; care not to swallow anything imperfectly masticated or too hot; and the occasional passage of a bougie, are the remedies.

II. PALSY OF THE ŒSOPHAGUS occasions inability of swallowing, but without pain or other symptoms of spasm; and a bougie, when passed, meets with no obstruction. It generally depends on organic disease of the brain or spinal cord, which must be examined into and cured if possible. The patient should be fed by the stomach-pump, by nutrient enemata, and by pushing soft food occasionally down the œsophagus with a probang. The palsy has sometimes been temporarily relieved by electrifying the patient on an insulating stool. Nutrient enemata should be composed of very strong beef or mutton broth, without salt or spice. The quantity injected at one time should not exceed four ounces; and if the rectum does not retain it a few drops of laudanum should be added.

III. DILATATION AND SACCULATION.—The œsophagus has been found after death exceedingly dilated. The symptoms during life were great *dysphagia*,—food, when swallowed, never seemed to reach the stomach, and was vomited in a few minutes. If this condition should be ascertained during life, the patient should be fed as in palsy. Sometimes a blind pouch is connected with the œsophagus, and occasions great distress in swallowing, by intercepting the food. It may be formed either by a protrusion of the mucous membrane through the muscular fibres, or by the sac of an abscess which has burst into the tube. The only remedy is to feed the patient constantly with the stomach-pump, so that the pouch may be allowed to close.

IV. PERMANENT STRICTURE of the œsophagus signifies a narrowing produced by a thickening of its coats, which form a firm ring, encroaching on the canal. It is generally found just below the termination of the pharynx; that is, opposite the cricoid cartilage, and is most frequent in females. The *symptoms* are, difficulty of swallowing, noticed probably for years, gradually increasing; never absent; and occasionally aggravated by fits of spasm. The act of swallowing frequently produces pain in the chest, which shoots between the shoulders, and up to the head. When a bougie is passed, it meets with an obstruction. The *causes* of this affection are generally unknown; sometimes, however, it appears to be a sequel of repeated quinsy, or to be caused by swallowing boiling or corrosive liquids; in one case it appeared to be induced by violent retching in sea-sickness. The *prognosis* is always serious, especially if the complaint is of long duration. If unrelieved, its *consequences* will be ulceration of the œsophagus, either above or below the stricture, with salivation, vomiting of purulent matter, and impossibility of deglutition, which in no long time will be followed by death. The fatal termination may be owing either to sheer starvation, or to the irritation of the local disease, or the extension of ulceration to the lungs.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Treatment.—A mild course of mercury, so as just to affect the gums;—occasional leeching, to relieve exacerbations of pain or spasm;—hyoscyamus or conium, if there be much irritability;—a seton between the scapulæ; and the occasional passage of a bougie, or of a *ball probang*—an ivory ball attached to a piece of whalebone or flexible wire—or of a piece of sponge moistened with a weak solution of nitrate of silver, and attached to a stout copper wire, as recommended by Sir C. Bell, are the remedies. The method of introducing the bougie is as follows:—The patient sits upright, with the head thrown as far back as possible, and the mouth wide open. The bougie, which should be previously warmed in the hand and oiled, and gently curved, is passed down into the pharynx in such a manner that its point may slide along the vertebræ. In order that it may not excite cough by interfering with the epiglottis, the patient should be directed to protrude the tongue from the mouth as far as possible; or to perform the act of deglutition just when the bougie is entering the pharynx. If it meets with an obstruction in its descent, the surgeon should slightly withdraw it, then again press it gently against the obstruction, increasing the pressure for a few minutes if it gives no pain. If it fail to pass, a smaller one should be tried.

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* This cut exhibits a stricture of the œsophagus. From the Museum of the Middlesex Hospital.

V. ULCERATION.—"Simple but fatal ulceration," as Mayo correctly called it; that is to say, *phagedænic* or *corroding* ulceration, without the pre-existence of epithelioma or of cancer (compare pp. 76, 105, 120), is liable to affect the pharynx at the level of the cricoid cartilage, or the œsophagus lower down. If the finger or a bougie is passed, its point returns marked with bloody pus. The consequences are always the same;—exhaustion from the irritation of the disease, and from the inability to swallow; or possibly a more speedy death from perforation of the aorta, or of the pleura.

VI. EPITHELIOMA and CANCER also sometimes affect this part. The symptoms are alike: burning pain between the scapulæ; and difficulty of swallowing.

Treatment.—A deposit of hard cancer into the walls of the œsophagus will at first be scarcely distinguishable from stricture, and must be treated like it; but when burning pain indicates ulceration, then nutrient enemata, belladonna plasters to the back, opium, ice-cream, &c., should be used to relieve the pain; and a very careful diet, including eggs, meat beat to a pulp, and other nutriment of small bulk.

VII. TUMOURS pressing on the œsophagus, whether abscesses, polypi, aneurisms, bronchocele, or enlargement of the bronchial lymphatic glands, will produce all the symptoms of organic stricture. Aneurisms and abscesses have been burst by the passage of bougies—with, of course, instant death in the former case, and relief in the latter. Before performing this operation, therefore, the chest ought to be well scrutinized by auscultation, to detect any unnatural pulsation or *bruit*; and any signs of embarrassed circulation or respiration should not be overlooked.

Polypus.—Cases are recorded of polypous tumours projecting into the pharynx or œsophagus. If discovered, an ingenious surgeon might remove them somehow.*

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* Vide Sir E. Home on Strictures, vols. i. and ii.; Monro on the Morbid Anatomy of the Gullet, &c.; Brodie on Local Nervous Affections (*spasmodic stricture*); Mayo's Pathology; Stokes in Cyclop. Pract. Med., vol. ii.; and Sir C. Bell's Institutes of Surgery, vol. i.; Arrowsmith's case of Polypus in Œso-

VIII. FOREIGN BODIES, when fixed in the PHARYNX, or about the aperture of the larynx, or in the œsophagus, produce a sense of choking, and fits of suffocative cough. This accident, if unrelieved, may prove fatal in two manners. The patient may either be suffocated at once, by spasm of the glottis, or, if the foreign substance remains impacted, it may produce a fatal ulceration of the parts, attended with exhausting cough and dyspnœa, and profuse fetid expectoration.

Treatment.—The patient should be seated in a chair, with the head thrown back, and the mouth wide open. The surgeon should then introduce his finger—regardless of attempts to vomit—and should pass it swiftly into the pharynx, and search the whole of it thoroughly. When the substance is felt, it may perhaps be entangled in the point of the nail, or curved forceps may be guided to it by the finger. Pins and fish-bones are often entangled about the velum, or in the folds of mucous membrane between the epiglottis and tongue.

If the body has passed into the œsophagus, and it is small and sharp (a fish bone, for instance), it may be got rid of by making the patient swallow a good mouthful of bread. If large and soft (as a lump of meat), it may be pushed down into the stomach with the probang. But large hard bodies, especially if rough and angular (such as pieces of bone or glass, &c.), should be brought up if possible. A pair of long curved forceps, or a piece of whalebone armed with a flat blunt hook, or with a skein of thread, so as to form an infinite number of nooses, are convenient instruments. If the stomach is full, a dose of tartar emetic dissolved in a very small quantity of water may be administered, in the hope that when the contents of the stomach are vomited, they may bring up the offending substance with them. One case is on record in which a chicken-bone lodging in the œsophagus was dissolved by making the patient swallow large quantities of dilute acid. If all means fail, however, and the substance can neither be brought up nor down, and if it be lodged in the cervical portion of the tube, it must be extracted by the operation of œsophagotomy in the following manner.

IX. ŒSOPHAGOTOMY.—The operation should be performed on the side towards which the foreign subject projects. Its situation having been ascertained, an incision of sufficient length must be made through the skin and platysma between the sternomastoid muscle and trachea. The cervical fascia must next be divided on a director. The surgeon must then divide the cellular membrane with a blunt knife, or lacerate it with his fingers, avoiding the carotid and thyroid arteries and the recurrent nerve. A common silver catheter may then be passed down the throat, and be made to project in the wound, so that the œsophagus may be opened by cutting on it. This small wound in the œsophagus should be dilated with forceps, in order to avoid hæmorrhage, and the

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phagus, Med. Gaz., N.S., p. 165. There is a case of congenital imperforate œsophagus in the Musée Dupuytren, at Paris; it was continuous with the trachea.

foreign body should then be extracted. This operation has occasionally been performed for the purpose of conveying food into the stomach in cases of stricture of the œsophagus, but with no very satisfactory results.*

X. USE OF THE STOMACH-PUMP.—The tube of this instrument is to be introduced in the same manner as the œsophagus bougie. It is usual to place a gag in the patient's mouth, having a hole for the tube to pass through, in order that it may not be compressed by the teeth. Before pumping out the contents of the stomach, one or two pints of water should be injected into it, and care should be taken *not to withdraw quite as much* as was injected. More water should then be thrown in, and the process should be repeated till it returns colourless.

The stomach-pump is by no means so universally efficacious as is popularly supposed. It ought only to be employed in those cases of poisoning by opium, of alcohol, or other narcotics, in which the stomach and nervous system are rendered so insensible that vomiting cannot be excited. For, in the first place, the operation is not free from danger. It is a well-established fact, that a tube may sometimes be passed into the trachea of a sensible person without creating any peculiar sensation, or exciting cough; but if the patient be insensible, that accident will be much more liable to happen. In fact, a case is on record in which a meddling surgeon, with more zeal than knowledge, did actually pass the tube down the trachea and inject the lungs with chalk mixture, which he had far better have permitted his luckless patient to have swallowed quietly; and Sir C. Bell tells us, that he has seen, on dissection, both lungs filled with broth, which was intended to have been injected into the stomach. Again, it is known that in one case the mucous membrane of the stomach was sucked into the holes of the tubes, and torn into strips—a thing likely to happen if the stomach is pumped too empty. Besides, this artificial evacuation of the stomach is by no means so efficacious as free vomiting, assisted by plenty of diluents. Lumps of arsenic were left in the stomach in the very case just cited, in which the mucous membrane was torn.†

SECTION III.—SURGICAL AFFECTIONS OF THE LARYNX AND TRACHEA, INCLUDING TRACHEOTOMY, AND THE VARIOUS CIRCUMSTANCES WHICH REQUIRE IT.

I. FOREIGN BODIES IN THE LARYNX AND TRACHEA.—It sometimes happens that a person who is busily laughing and talking during a meal, suddenly rises from table, attempts to put his finger into his throat, speedily turns blue in the face, and then drops down dead. This arises from a piece of food getting into the *rima glottidis*; a thing liable to happen if a sudden inspiration be made through the mouth, as in laughing, when the mouth is filled with food. It rarely happens that the surgeon arrives in time to do any good; but if he should be promptly on the spot, he ought to search the pharynx with his fingers, to ascertain whether the obstructing substance can be removed; and if not, he ought to perform laryngotomy immediately; and to pass a probe up into the larynx through the wound, so as to push the foreign substance back into the mouth.

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* See Arnott on Œsophagotomy, Med. Chir. Trans., vol. xx.; Report of a case in which it was performed unsuccessfully for the relief of stricture by Mr. Watson, of New York, and of two cases in which it was performed for the removal of a foreign body, in vols. ii. and iii. of Ranking's Abstract.

† See an amusing Clinical Lecture on the abuse of the Stomach-pump, by Professor Watson, in Lond. Med. Gaz., vol. xvii.; and Roupell's Illustrations of the Effects of Poisons.

When a foreign substance has passed the *rima glottidis*, and has got into the trachea, it will produce different symptoms according to different circumstances. For, in the first place, it may be impacted in the ventricles of the larynx or upper part of the trachea; in which case it will probably produce violent spasmodic cough and difficulty of breathing, together with a fixed pain referred to one particular spot—a croupy sound during respiration, which may be heard by the stethoscope most distinctly at the seat of that pain; and loss of voice.

In the second place, the foreign substance may be loose in the trachea. In this case, the violent coughing and sense of suffocation produced by its first introduction generally subside for a time; but every now and then there are violent fits of coughing, and of spasmodic difficulty of breathing, during which the substance may be heard by means of the stethoscope, or perhaps may be felt by the finger to be forcibly impelled against the upper part of the larynx.

Thirdly, the foreign substance may have passed into one of the bronchi, where, perhaps, it may be detected by causing a whistling or murmuring sound: and it will very probably be dislodged and driven upwards when the patient coughs.

The right bronchus is that into which it generally falls, because it is a little anterior to the left, and encroaches a little on the middle line.

It is sometimes difficult to distinguish the symptoms produced by a foreign body in the larynx or trachea from those of croup or laryngitis. But the surgeon may generally pretty confidently decide that a foreign body is present, if the symptoms came on suddenly during a meal;—or perhaps the history will be that the patient was playing with a button, or cherrystone, or some similar body in his mouth, and that he chanced to fall down, when the button disappeared, and the symptoms came on directly afterwards. Moreover, in these cases, expiration is generally more difficult than inspiration, whereas it is usually the reverse in croup. Besides, when there suddenly occurs a fixed pain, and a fixed whistling sound in the larynx or bronchi, without any other symptoms of croup, the case must almost of necessity arise from a foreign body.*

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* See an interesting paper by Mr. C. Hawkins, and another by Mr. Travers, jun., Med. Chir. Trans., vol. xxiii.; Sir B. Brodie on Mr. Brunel's Case, Med. Gaz., July 7th, 1843; a Review of Gross on Foreign Bodies in the Air Passages, by Mr. Henry Lee, Brit. and For. Med. Chir. Rev., Jan. 1856.

If there is any doubt, the pharynx and œsophagus should be well searched, by finger and probang, to make sure that the foreign body is not there.

If any foreign body remains in either bronchus, it sets up more or less irritation: cough, pain, mucopurulent expectoration; perhaps night-sweats, and other signs of hectic.

Treatment.—When any foreign substance has entered the trachea, the indication plainly is, to get it out again; and the great point in the treatment is, to lull the vigilance of the muscles which guard the aperture of the glottis, so as to induce them to let it pass out by the way it entered. For it must be remarked that it is muscular spasm, excited by the contact of the foreign body, which not only hinders it from escaping when driven up to the glottis by the breath in expiration, but puts the patient in danger of suffocation as well.

In the first place, therefore, if the substance be moveable, and round, and the symptoms not urgent, let the patient be kept quietly in bed and under the influence of narcotics, in doses proportioned to the age; such as syrup of poppies with tincture of henbane and a little ipecacuanha. Then probably the substance may become coated with mucus, and may be expectorated during an effort at coughing or vomiting.

If the symptoms be more urgent, let the patient be put quickly under the influence of chloroform, with the same purpose of lulling the muscles of the larynx; when narcotized let him be turned upside down; a child may be held with his head downwards, and be slapped on the back without ceremony; for a heavy person an apparatus will be necessary, in order to fasten him into a chair, such as was contrived by Mr. Brunel when he had swallowed the half-sovereign.

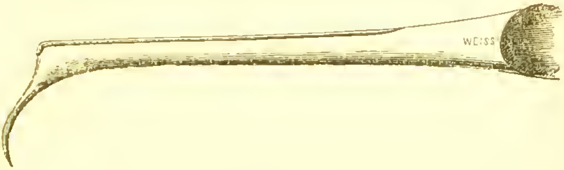
But if this proceeding does not answer, or if it seems to induce the risk of suffocating the patient, the air-tube must be opened; and this for two reasons: in order, first, to provide means for breathing; and secondly, to provide, if necessary, for the extraction of the intruding substances. For it must be remarked, that the irritability of the glottis subsides, so that the foreign body may pass through it, so soon as an artificial opening is provided.

II. LARYNGOTOMY AND TRACHEOTOMY.—The air-tube may be opened either through the larynx, or through the rings of the trachea. The former operation is the more quickly and easily performed on an adult; it is further from the lungs, and less dangerous. Tracheotomy is more difficult and tedious; but is necessary if there is any idea of introducing a forceps.

Laryngotomy is performed by cutting longitudinally through the skin, then through the *cricothyroid* membrane, which may be felt as a soft depression, an inch below the *pomum Adami.*

Tracheotomy is thus commonly directed to be performed:—The head being thrown back, an incision, an inch and a half to two inches long, must be made exactly in the middle line from below the cricoid cartilage to the top of the sternum. The skin, superficial fascia, and fat, are then divided; the sternohyoid muscles are separated with the point of the knife; the loose cellular tissue and veins are cleared from the front of the trachea with the fingers or handle of the scalpel; the thyroid gland, if in the way, is pushed up; a tenaculum is hooked into the trachea to draw it up slightly and steady it; then the surgeon seizes the moment, and whilst the trachea is stretched, sticks in his knife, with a slight jerk, at the bottom of the wound, and carries it upwards, so as to divide two or three of its rings.

Various other methods of performing Tracheotomy.—There are several instruments and plans which have been devised, for the purpose of rendering tracheotomy a more easy and safe operation. Amongst these we may mention first, Dr. Charles Edwards's plan of operating *above the isthmus of the thyroid gland*, and immediately below the cricoid cartilage. The operator should feel for the cricoid cartilage, and ink a perpendicular line, a quarter of an inch long, in the middle line below it. The skin should be drawn up over the thyroid, and then cut through in this line. Then the cricoid cartilage and first ring of the trachea being made out, the hook of the steel director is to be hooked in just below the cricoid, and made to hold the larynx well upwards and forwards. It will be seen that the groove of the director is open to the very end, and that on the opposite side to the groove the instrument finishes in a tenaculum hook. This hook then being fixed under the cricoid, and held up with the operator's left hand, a narrow stout scalpel is passed along the groove, with its edge downwards. "Should the thyroid isthmus," says Dr. Edwards, "or any pulsating vessel be in the way below, the puncture should barely admit the extremity of a probe-pointed bistoury;" in which case the bistoury being steadied against the end of the groove may be made to divide two or three rings of the trachea from within outwards in subcutaneous fashion; the soft parts over the trachea can be dilated enough afterwards to admit of the introduction of the tube. Of course if the surgeon chooses to perform the operation below the thyroid gland, this instrument will be equally useful.*



Another ingenious modification is proposed by Mr. Henry Thompson,† who has devised the instrument shown on page 476. This consists of two blades, united at one end by a hinge; at the other bent downwards at an angle, and furnished with cutting edges, nicely adapted together, so as when pressed together, to make as it were but one edge. There is a screw, by which the blades may be separated. The patient lying down, the surgeon feels with his left forefinger for the lower edge of the cricoid; holding the instrument in his right, with the blades closed, he introduces the cutting point, transversely, in the middle line, about a quarter of an inch below the cricoid, so as to slip the point into the trachea, between the first and second rings. Then the blades are separated by the screw, sufficiently to admit a tube; the screw is then reversed and the instrument withdrawn.

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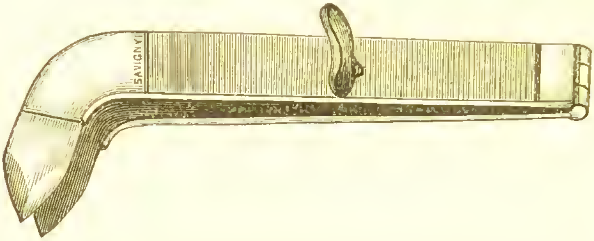
* Charles Edwards, M.D., Lancet, 1853, vol i., p. 492.

† Lancet, 1853, vol. i., p. 221.

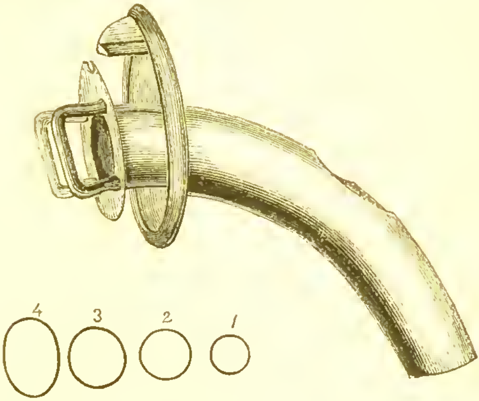


Trocars have been invented for tracheotomy, for which they are dangerous. They should never be used upon children, although they might be introduced between the cricoid and thyroid cartilages in the adult.

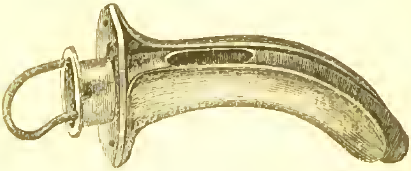
The great danger and difficulty of the operation, is the bleeding from the numerous veins which lie in front of the air-tube, and which are kept filled by the embarrassment of the breathing. The instant the trachea is opened, blood rushes in with the air during inspiration, and the patient is very liable to be suffocated. In any such case, the surgeon should not hesitate to suck out the blood and mucus with his naked mouth, or through any catheter or tube, or with a syringe. But in order to prevent this accident, he should use the knife most sparingly, and should be particularly careful not to cut downwards near the sternum. He should separate the tissues and clear the front of the trachea with a blunt hook, or the handle of the scalpel. Bleeding, if arterial, should be checked by ligature; if venous, by iced water, compression with the fingers, the ligature, or actual cautery; and the trachea should not be opened till it is suppressed.

So soon as an opening is made, the foreign body is sometimes expelled with a strong gust of air through the wound; sometimes through the now tranquil glottis; but if not, it may be gently searched for with a probe, and be removed by forceps or by a blunt hook; or the patient being chloroformed, may be turned upside down, and slapped on the back, as we have before said.

If this proceeding is not successful, the patient must be sent back to bed, and be kept slightly narcotized; and after a day or two the effort to remove the foreign body may be repeated. But in this case, and in any other in which the operation was performed for the relief of dyspnœa, a curved tube should be introduced for the patient to breathe through. It should fit tightly into the aperture, and prevent the entrance of blood into the trachea. It should be of such a size, as Trousseau has remarked, that the air may pass through it in respiration without any whistling noise.* When the patient wishes to cough, or speak, or swallow, he must be taught to close its orifice with his finger. It should be double, as represented in the following figure, so that by withdrawing the innermost tube, it may be cleared of any mucus that may accumulate in it. It should have a hole in its convex surface, so that the patient may have the benefit of the air that enters by the larynx. The surgeon should have several sizes. Those indicated in the cut are the sizes made by Matthews. The tube depicted is the exact size of No. 4.



The next drawing represents a double tube, the outer of which is reduced to two slips: by pressing these together its introduction is made easy.



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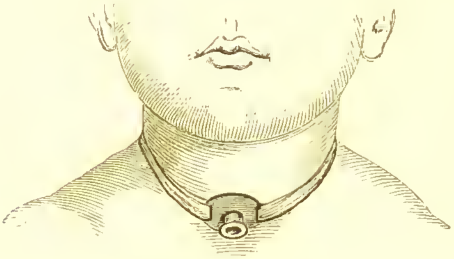
* Trousseau de la Trachéotomie, L'Expérience, Nov. 5, 1840; Clin. Lecture, Med. Times, Jan. 4, 1856. The writer begs to acknowledge the benefit and pleasure with which he has listened to Professor Trousseau's observations on this subject, in the wards of the Hôpital des Enfans Malades. A series of papers on Tracheotomy by Dr. Turner, of Keith, are well worth reading, Prov. Med. Journal, 1854. Also Dr. Semple's Memoirs of Diphthérite, New Sydenham Soc., 1859.

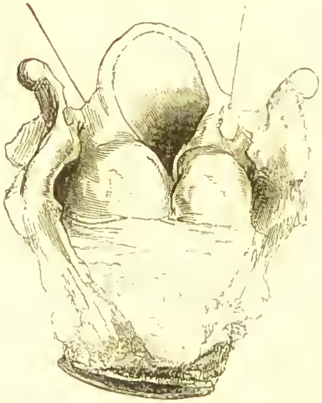


The tube should be secured by a tape round the neck, as shown in the adjoining drawing of a patient of Mr. Partridge, in King's College Hospital: a boy aged five, whose trachea had been opened on account of the presence of a foreign body.

The throat should be carefully wrapped in a woollen comforter, and the air be made moist. M. Trousseau has pointed out the important fact, that a difficulty of swallowing is liable to come on about the fourth or fifth day; and that it is expedient to give thickened soups, pounded meat, and other half-solid substances; liquids are then apt to enter the larynx, because the epiglottis is *out of gear.*

III. TRACHEOTOMY OR LARYNGOTOMY is required for any disease or injury which causes mechanical impediment to respiration.

1. In acute *laryngitis*, *croup*, and *diphtheria*, when suffocation is imminent, tracheotomy should be performed. Some surgeons condemn it in croup, on the plea of its hopelessness. But we reply that it is the only remedy; that it has undoubtedly in many cases prolonged a life which was on the verge of extinction; that it furnishes an exit for flakes of false membrane that cannot pass the rima glottidis; and that it very likely would be more successful if it were done earlier, without waiting till the patient is exhausted by struggling for breath. Moreover, Mr. Henry Smith has well shown that in some fatal cases of croup, the obstruction has been seated in the larynx only, and that an opening below would have saved life.



In the state called *œdema glottidis*, in which the submucous tissue about the glottis becomes infiltrated with serum in consequence of a low degree of inflammation, or of a general dropsical diathesis, a glance at the preceding figure will show that an artificial aperture must be often necessary to preserve life. This state may be suspected when intense dyspnœa, not referable to disease in the chest, and hoarseness arise, either during sore throat, or erysipelas; or after scarlet fever.

2. In *chronic inflammation and ulceration of the larynx* the operation should also be performed before the disease has lasted long enough to exhaust the patient by the spasmodic cough, dyspnœa, and purulent expectoration which attend it. This is an occasional consequence of secondary syphilis, as mentioned at p. 200, and more frequently of confirmed phthisis; but the operation should always be performed if there is imminent danger of suffocation, even though the patient's ultimate recovery may be quite hopeless.

3. The operation is sometimes required for *tumours, warty excrescences, and epithelial growths within the larynx;* cases that will generally be obscure, inasmuch as their symptoms must be nearly the same as those of the foregoing cases; beginning with hoarseness, tickling cough, and noisy breathing; with purulent or bloody expectoration if ulceration occurs.

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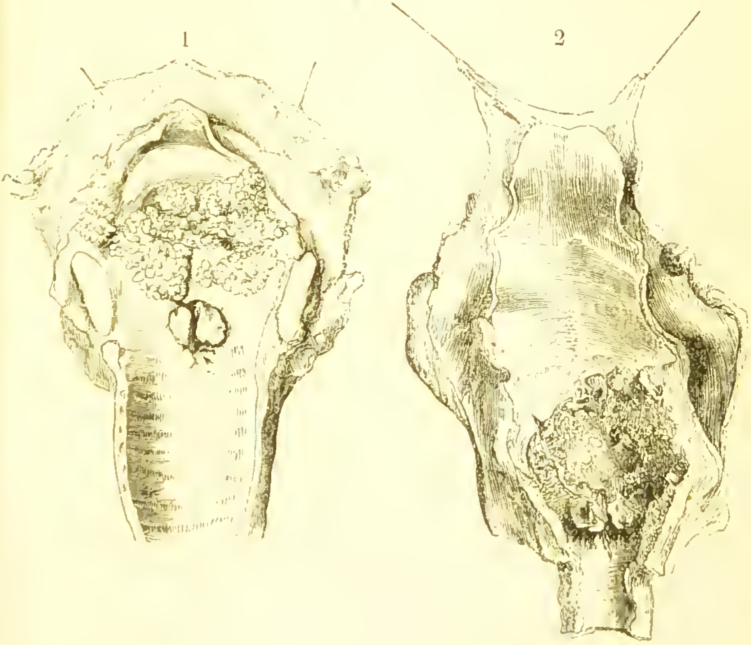

4. Tracheotomy was proposed nearly 20 years ago by Mr. Mayo, as a palliative in *hydrophobia.* It has since been proposed by Dr. Marshall

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[*] 1. Warty excrescences within the larynx. Laryngotomy had been performed. From the Middlesex Hospital Museum.—2. Ulceration of the larynx. Both cases probably epithelioma.

Hall, in order to relieve or prevent the congestion within the head, which may precede the severer *epileptic fits*, from the spasmodic closure of the rima glottidis. Experience alone can determine the value of this proposal.* But we may observe that hydrophobia does not kill by suffocation.

5. *Cases that simulate Laryngeal Disease.*—Some years since, the medical journals made themselves merry at the expense of the house-surgeon to one of the largest hospitals in London, who, being summoned in the night to a patient apparently dying of dyspnœa, immediately performed tracheotomy, but without avail; for the man expired very soon afterwards; and on a *post-mortem* examination it was found that there was nothing the matter with the larynx, but that a large aneurism existed on the arch of the aorta. What was the use, it was said, of cutting the throat of a man who was dying of aneurism? The house-surgeon, however, was not to blame, because, as is now very well known, tumours about the aortic arch may produce spasm of the glottis, by interfering with the recurrent nerves. But now that this fact is known, every surgeon should carefully scrutinise the chest in obscure cases of dyspnœa, to see whether it arise from this cause. No permanent good can then result from tracheotomy; yet the author heard of a case lately, at the Winchester Hospital, in which it certainly rescued a patient from immediate death, although he died shortly afterwards from other effects of the aneurism. But the operation is not admissible in that spasm of the glottis which often affects children during teething; nor yet in cases in which the symptoms of laryngitis are mimicked by hysteria.†

The application of a solution of nitrate of silver (gr. xx. ad ℥i) *within the larynx* is, on general principles, likely to be beneficial in cases of disease of a prolonged asthenic or irritative character;—obstinate cough, such as the latter stages of hooping-cough; obstinate hoarseness or loss of voice; or ulceration from any cause, with copious expectoration. The tongue must be drawn downwards and forwards with the left forefinger, or with a curved spatula; and then a curved probang carefully coated with sponge, a quarter of an inch in diameter, moistened with the solution, should be passed into the glottis. It must not be allowed to touch the pharynx, or it will cause efforts at vomiting.

IV. POLYPUS OF THE EPIGLOTTIS, LARYNX, AND TRACHEA.—Professor Ehrman of Strasbourg has collected the histories of thirty-one cases of polypus of these parts in the human subject, three in the cow, and two in the horse, in an interesting monograph. The early symptoms are hoarseness, and perhaps loss of voice, especially if the tumour be situated near the chordæ vocales; cough of a croupy, suffocative character; sense of obstruction in breathing, speaking, or swallowing; dyspnœa, gradually increasing with the growth of the tumour, next coming in terrific fits of suffocation, at last fatal: when the tumour, if within the trachea, is driven up between the chordæ vocales by expiration; or if attached to the epiglottis, is drawn down by inspiration. The most distinctive symptom is a valvular flapping sound heard or felt when the tumour moves during respiration. In more than one case the tumour, or a portion of it, has been torn off and coughed up: this of course decides the diagnosis. In a case by Mr. Stallard, the tumour was detached within the trachea, and the patient died suffocated. Polypi here, as elsewhere, are usually fibro-cellular, fibro-plastic, or epithelial. The symptoms above detailed are such as imperatively demand tracheotomy. But besides this, if the presence of a tumour is ascertained, or is highly probable, further measures may be adopted. If the tumour is attached to the epiglottis, it may be removed from above. If lower down, the larynx must be opened, an operation which will be easily added to the tracheotomy.*

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* And experience, like reason, is strongly against it. See cases of failure, by Dr. Ogle and Dr. Ormerod, of Brighton, quoted in Ranking, vol. xxvii.

† See papers by Dr. Horace Green, and Dr. S. Watson, in Ranking, vol. xvi.; Wagstaffe, Cotton, and others, at Lond. Med. Soc.; Lancet for 1852. J. Hughes Bennett on Pulmonary Tuberculosis, Edinburgh, 1853. *Coxeter's Laryngeal Syringe*, for introducing a few drops of caustic solution into the larynx, is a good substitute for the probang.

In a case which occurred to Professor Ehrman, the patient, a healthy woman, æt. 33, had lost her voice for three years; when she began to experience a sensation as of the opening and shutting of a valve in the larynx; violent cough came on occasionally during swallowing, and caused expectoration of small portions of tissue. She was suddenly seized with a fit of suffocation, almost fatal, when Professor Ehrman performed tracheotomy, and the next day extended the incision upwards, through the junction of the alæ of the thyroid cartilage, and removed a cauliflower excrescence from the left vocal cord. Recovery was complete, except of the voice. Seven months afterwards the patient unfortunately died of typhoid fever. The tumour was epithelioma, and had just begun to sprout again when the patient died. In another case, Dr. Brauers, of Louvain, laid open the larynx and cauterized a warty excrescence with acid nitrate of mercury and actual cautery. Final result not stated. These examples show that in any case of laryngeal disease requiring tracheotomy, the larynx itself may, if necessary, be opened, examined, and submitted to direct treatment.

V. Fractures of the Os Hyoides or of the Thyroid Cartilage are rare accidents, which may be produced by blows or falls on the front of the throat. The symptoms are pain; displacement of the fragments, ascertained by examination; difficulty of swallowing or of breathing; and perhaps hæmorrhage from the mucous membrane, which may be lacerated; perhaps emphysema. The treatment must depend on the urgency of the case. In a case of perpendicular fracture of the thyroid cartilage, seen by Dr. Gibb, the two lateral portions of the cartilage were separated at the pomum Adami, but the only symptoms were loss of voice, and an "indescribable sensation" in the throat.* In a case of fracture of the hyoid bone, the mouth was kept open by a gag, whilst the fragments, which had been displaced, and had even pierced the mucous membrane of the fauces, were restored to their proper position. Ice may be applied outwardly if hæmorrhage is very profuse, or inflammation violent. The trachea must be opened if requisite to provide for breathing, and the stomach-pump if the patient cannot swallow.

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* Histoire des Polypes des Larynx. Strasburgh, 1850; case by Mr. Stallard, Med. Gaz., 19th May, 1843. There is a preparation of it in the King's College Museum from Mr. Mayo's collection.

VI. SCALDS OF THE GLOTTIS, through swallowing boiling water or corrosive fluids, produce the ordinary symptoms of laryngitis—suffocative cough, and dyspnœa.

Treatment.—Leeches, ice to the throat, opiates to tranquillize, and tracheotomy if required.

VII. HANGING may destroy life in three ways. 1. By dislocating the neck. 2. By compressing the trachea, and suspending respiration. 3. By compressing the jugular veins, and inducing apoplexy.

Treatment.—Artificial respiration, bleeding from the jugular vein if the face be turgid, dashing cold water on the face and chest, and a current of galvanism passed from the nape of the neck to the pit of the stomach, so as to excite the diaphragm.†

VII. DROWNING, *Treatment of.*—Let the head hang down for *two seconds*, to let any water run out of the mouth: then lay down the body with the head raised; put two fingers into the mouth and draw the tongue well forwards; wipe out the mouth and throat; strip off wet clothes; wipe the face, nose, and eyes dry; and set people at work to rub the rest of the body dry. If breathing has nearly but not quite ceased, endeavour to rouse the circulation and the respiratory acts by friction of the entire surface, occasionally dashing cold water on the face, neck, and chest, and then wiping quite dry with a warm towel; and by tickling the nose and fauces, to excite sneezing, coughing, or vomiting.

If breathing should not be thoroughly restored by these means, it should be set to work artificially.

In some cases it may be expedient to draw blood from the arm, or jugular vein, in order to lessen the load of the heart; and this operation (or leeches) may be required for congestion of the head or chest, after the immediate peril has passed away.

Enemata of brandy may be of service in the early stage, whilst the heart's action is faltering.

A case is related in which life was restored by the most persevering friction, which was kept up for eight hours before the humanity of the surgeon, Dr. Douglass of Havre, was rewarded by a return of respiration.*

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* The author has to thank Dr. Gibb for the following references:—Dr. Gibb's case, Brit. Amer. Med. Journ., Montreal, vol. vi., p. 306; Cases of Fracture of Hyoid Bone, Amer. Journ. Med. Sc., Philadelphia, vol. xiii., 1833, p. 250; Stethoscope, Richmond, Vir. U. S., June, 1855; Pathological Trans., vol. i., p. 199; Fracture of Thyroid Cartilage, Brit. and For. Med. Rev., N. S., vol. viii., p. 272.

† For the manner of applying galvanism in these cases refer to Part V. Chap. II.

IX. Artificial Breathing is required in all cases of suspended animation, whether from drowning, injury, noxious gases, chloroform, or narcotic poisons. It may be performed by passing a pipe through the mouth, or a male catheter through the nostril, into the glottis; or by simply putting a pipe into one nostril, and closing the mouth and the other nostril, and blowing through it. But it is a better plan to use a small pair of bellows, putting its muzzle into one nostril. The operator should be careful to force the air into the lungs with very great gentleness, and to press the larynx against the spine, so that the air may not go down the œsophagus. If the larynx has been crushed by a rope, or by a violent blow, it may be necessary to perform tracheotomy, so as to impel a current of air directly into the trachea.

Or, instead of forcing air *into* the lungs, the operator may employ Dr. Sylvester's method, of imitating the natural expansion of the chest by muscular effort.† The patient is laid on his back with the shoulders raised; the tongue brought forward, and retained, if necessary, by gently closing the patient's teeth in it. Then the operator raises the patient's arms by the side of his head, and extends them gently and steadily upwards and forwards for a few minutes. This action imitates inspiration. Then the patient's arms are turned down, and gently and firmly pressed for a moment against the sides of the chest: this imitates a deep expiration. These actions should be perseveringly repeated about fifteen times in a minute.

SECTION IV.—SURGICAL AFFECTIONS OF THE EXTERNAL PARTS OF THE NECK AND THROAT.

I. Wounds of the Throat are generally made with intention of suicide, and are extremely dangerous, no less from the importance of the parts injured, than from the despondency of the patient.

Treatment.—The general indications are, 1st, to arrest hæmorrhage; 2ndly, to obviate difficulty of breathing; 3rdly, to prevent inflammation of the trachea or chest.

In the first place, any arteries that are wounded must be tied, and hæmorrhage from large veins must be restrained by pressure with the finger, kept up as long as may be necessary. The patient should be put to bed in rather a warm room; and so soon as all oozing has ceased, but not before, his shoulders should be raised by pillows, and the head be bent forwards, and be confined by a bandage passing from each side of the nightcap to the shoulders. Plasters are inadmissible, and so are sutures, except in the cases that will be alluded to presently. If the wound penetrates the trachea or larynx, it should be covered with a loose woollen comforter, or a layer of cotton wool, or, after the first week, with one of Jeffreys' respirators, if it can be nicely adapted. The patient should not be kept too low; and if the pharynx or œsophagus is wounded, a common, large-sized, elastic catheter may be passed, or the elastic tube of the stomach-pump, through which nutritive fluids can be injected by means of an elastic bottle. But if during the inflammatory stage the attempt causes great irritation, it may be necessary to employ nutrient enemata merely. At all events, no tube should be passed through the wound for that purpose. The great thirst and dryness of the fauces, experienced in these cases, may in some measure be mitigated by sucking a wet rag, or, still better, a lump of Wenham Lake ice. If the patient finds great difficulty in expectorating through the wound, he must be taught to close it partially by leaning his head forwards, and placing his fingers on it, whilst he makes an expiratory effort, so that he may expel the air with a sudden gust.

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* Med. Gaz., 23rd December, 1846.

† The True Physiological Method of restoring persons apparently drowned or dead, and of resuscitating still-born children, by H. Sylvester, M.D. Lond., 1859. There is a rolling method, invented by the late Dr. Marshall Hall, very ingenious, but coarse and inefficient by the side of Dr. Sylvester's.

In every stage of the cure, difficulty of breathing should be viewed with suspicion. It may arise from several causes. 1. If the wound is above the larynx, it may be caused by the epiglottis being detached from the tongue, and hanging down upon or irritating the *rima glottidis*, or by clots of blood collecting in the pharnyx. 2. It may be caused by an irregular and jagged division of the larynx or trachea, so that some pieces of the cartilage hang into the tube; or supposing the trachea to have been completely cut through, it may be caused by the aperture of the lower portion being overlapped by the upper. In these cases it may be requisite to employ sutures, but they should be passed merely through the cellular tissue around the cartilage, and neither through the cartilage nor the skin. 3. It may be caused by swelling of the mucous membrane of the larynx and trachea in the acute inflammatory stage immediately after the injury; or by chronic thickening of that membrane from the continued irritation of cold air, if the wound is very slow in closing. In the former of these cases, free antiphlogistic measures must be used; the latter must be prevented by using a proper position, so as to promote the approximation of the wound whilst it is healing. In either case it may be necessary to make a longitudinal division of the trachea to relieve the dyspnœa. 4. Another frequent cause of dyspnœa is the passage of blood into the trachea, if the wound is prematurely closed, and especially if it is sewn up or covered with plasters. Even supposing the trachea not to be opened, great danger may result from closing a wound of the throat before bleeding has ceased, for the blood may accumulate in the cellular tissue, and coagulate, and compress the trachea.

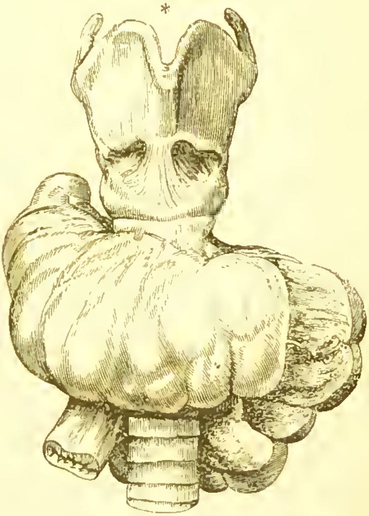
II. BRONCHOCELE (*Goître, Derbyshire neck*) signifies an hypertrophy of the thyroid gland.

Symptoms.—A soft, projecting, elastic tumour occupies the front of the neck, in the situation and of the shape of the thyroid gland. It is rarely tender, and the skin is not discoloured. Frequently one lateral lobe is larger than the other; and occasionally the middle lobe or isthmus is solely or principally affected.

Consequences.—When of moderate bulk, it rarely causes any inconvenience, except occasional headache, and difficulty of breathing in a stooping posture. But when very large, it may produce a most dangerous difficulty of swallowing and breathing, and congestion in the head by its pressure on the trachea, œsophagus, and jugular veins;† or it may induce thickening and disease of the trachea, with most obstinate cough, which may end in consumption.

Diagnosis.—It is to be distinguished from encysted and other tumours by its shape, by its want of fluctuation, and by its mostly affecting both sides.

Prognosis.—If it be soft and recent, and occur in a young patient, it will most likely be cured; but probably not if it be old, hard, and the patient advanced in life.



Anatomy.—The disease begins, probably, with hypertrophy of the natural gland structure, and concurrent formation of cysts. The gland structure nearly resembles that of the secretory glands; that is to say, consists of pouches of pellucid membrane, containing nuclei and nucleated cells; although not provided, like the secretory glands, with ducts. The cysts are developed in the interstices of the gland structure, and often have growths of it sprouting from their walls. Some cysts attain large size, and are filled with glairy matter, more or less solid: in very old cases earthy deposit may be formed. Other cysts which contain blood, or a bloody liquid, are probably the remains of dilated veins.‡ (See pp. 103, 322.)

Causes.—Bronchocele is what is termed an *endemic* disease: that is, one extremely prevalent in certain localities; amongst which may be mentioned Derbyshire, Nottingham, and the chalky parts of England generally; and various Alpine and mountainous districts, especially the Tyrol and valley of the Rhone. The use of melted snow; or of water impregnated with calcareous or earthy particles, to which the inhabitants of all those places are more or less habituated, although not perhaps the invariable cause, is the most probable that can be assigned.* In England it most frequently affects females about the age of puberty, and in many cases is obviously connected with uterine derangement. Patients so often refer its origin to some twist or strain of the neck, that there is some reason for believing that such an accident may be an exciting cause. The most practical point to be gathered from the consideration of its causes is this: that most persons who are subject to it always find it increase at times when their health and strength are lowered by any circumstance; and that in countries where it is endemic, it is closely associated with cretinism and idiocy. Therefore it is to be looked on as a disease of low degenerative type, and treated accordingly.

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* From the King's College collection. The œsophagus is seen to be pushed to the right side by the tumour.

† Mr. Howship gives a case of bronchocele with the jugular vein passing through its substance. The patient suffered greatly from congestion in the head.

‡ Vide Baillie's Morbid Anatomy, by Wardrop, 2nd ed., p. 84, and Turner's Art of Surgery, vol. i., p. 198. The second cut exhibits a preparation in the Middlesex Hospital Museum. The tumour is full of earthy deposit.

Treatment.—The best remedy for this disease is iodine, combined with iodide of potassium to render it soluble, as in the compound tincture of the London Pharmacopœia, and given in such doses as not to cause pain or disorder of the stomach or the general health. (F. 88.) A lotion of iodine with iodide of potassium, may also be applied to the tumour; but it must be remembered that the swelling generally enlarges, instead of decreasing, if the skin be irritated. The patient, if possible, should remove from a district in which the malady is prevalent, and should drink boiled or distilled water. A residence on the coast, and warm sea-bathing, are mostly advantageous. Any disorder in the digestive or uterine organs should be carefully removed, for bronchocele seems often to be connected with uterine disorder. Steel, iodide of potassium with bark, and aloetic purgatives: in some cases anti-hysteric remedies are of service. Other remedies which were in vogue before the discovery of iodine, and which may be resorted to if that fails, are as follows: bromine; the bromides of potassium and of iron; chlorides of barium and calcium; mercury; iron; potass; soda; digitalis, hyoscyamus, and belladonna; and sea-water.

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* Capt. Alexander Gerard, in his account of Korrawur in the Himmalayas, says, that "although the Korrawurrees can get nothing but snow for some months in the year, they are not so subject to goîtres as the people that live in the damp grounds in the forest at the foot of the hills, where there can never be any snow water."

If medicine proves ineffectual, and the tumour enlarges rapidly, so as to threaten suffocation or apoplexy, surgical operations must be resorted to. There are three which have been proposed and practised:—viz., the introduction of setons; ligature of the arteries which supply the gland; and extirpation. The general results of these operations may be stated thus:—All three of them have at different times succeeded; all of them are hazardous to life, and have proved fatal; and the first two have, in some instances, failed to remove the disease, although the patient has recovered with his life.

If a *seton* be passed, it should be of silk, and large enough to fill the wound made by the needle, so that there may be no fear of bleeding. The needle should be long and narrow. If after the seton has remained for some time, it ceases to produce a diminution of the gland, it should be withdrawn, and be reintroduced in another place.

Extirpation of the gland is performed by making an incision in the middle line of the neck; the skin and muscles must then be dissected from the tumour; and every artery be tied as soon as it is divided. Then (as it is mostly enlargement of the isthmus, or middle lobe, that requires this operation), a strong double ligature should be passed through it, and should be firmly tied on each side of it, before it is cut out.

Encysted Tumours.—The *cysts*, which are formed in this gland, and which contain a glairy matter or blood, often require treatment. If necessary, they may be punctured, when they will most likely inflame, suppurate, or lose their lining membrane by sloughing, and contract. If this does not answer a seton should be passed. They are apt, after puncture, to give exit to a great quantity of arterial blood; if this prove troublesome, the wound must be filled with lint, when it will readily cease. In a case of cyst in the thyroid gland, which occurred to Mr. Fergusson, he could distinctly feel something of atheromatous consistence within it. An incision having been made, this turned out to be a cauliflower intracystic growth, so extremely vascular, that the wound was obliged to be closed. Similar cysts are liable to form in other parts of the neck, not connected with the thyroid gland. Their treatment is the same.*

This gland may further be affected with acute and chronic *inflammation*, and tubercular deposit; either of which may lead to abscess. Their *treatment* must be conducted on general principles.

It has also been affected with cancer, although rarely. Some cases of it are recorded in the Med. Chir. Trans., vol. xxvii., by Mr. Cæsar Hawkins, and by Mr. Brown, of Bath. The patients presented solid tumours in the situation of the gland, not having the characters of ordinary bronchocele; and one distinctive feature was the fixity of the parts.

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* Vide a paper by Mr. B. Phillips in Med. Chir. Trans., vol. xxv., on Tumours in the Neck not involving the Thyroid Gland; Paget, Lectures, vol. ii.; Fergusson, Pract. Surg., 3rd edit., p. 655.

III. HERNIA BRONCHIALIS (*Bronchocele vera, Goître aërien*) is a very rare tumour, formed by a protrusion of the mucous membrane through the cartilages of the larynx or the rings of the trachea, and caused by violent exertions of the voice. Larrey met with sundry instances of it in French officers, and in the muezzin or priests that call the people to prayer from the minarets in Mohammedan countries. The tumour is soft and elastic, can often be made to disappear by pressure, and is increased by any exertion. The only available treatment is moderate support.*

IV. PAROTID TUMOURS.—This name may be assigned to those tumours which occur in front of the ear, over the parotid gland. Cysts of various sorts, filled with glairy matter, or with blood; enchondromatous tumours, pure, or mixed with newly-developed gland tissue, and enlarged lymphatic glands, are the commonest; cancer may also be met with. Such tumours may of course involve the facial nerve; the facial artery, or the external carotid; or may extend inwards to the pterygoid and styloid processes. "If there be reason to suspect," says Mr. Liston, "that the disease is of a malignant nature, and not thoroughly limited by a cellular cyst, no interference is admissible. If, on the contrary, it be at all moveable, has advanced slowly, possesses a smooth surface, and is firm (neither of stony hardness, nor pulpy), then an operation may be contemplated." If slowness of growth and capability of being *moved freely* concur, the surgeon should remove such tumours; keeping his knife close to the tumour, especially at its deep part, so that he may not divide the nerve or artery, if possible. Sometimes, however, they may be so involved, that their division is unavoidable. The patient should always therefore be warned of the possibility of facial paralysis after removal of one of these tumours.

V. TUMOURS IN THE SIDE OF THE NECK.—Every variety of tumour may be found in this locality; enlarged lymphatic glands; cysts serous and sanguinolent; tumours composed of gland structure, like that of the thyroid gland; fibroplastic tumours, and cancer; the last possibly involving the great vessels, or attached to the vertebræ. If subjacent to the skin merely, and freely moveable on the subjacent tissues, they may readily be removed; but if they lie deep, and are bound down by the platysma and fascia, they require some consideration. If a tumour be of slow growth, defined in its outline, and moveable, so that it is probably not cancer, or if it interferes with deglutition or respiration, its extirpation may be attempted. If any suspicious tumour is of recent origin, the surgeon should wait, to see whether rapidity of growth and implication of adjacent parts give reason for believing it to be cancerous. See the remarks on the removal of tumours in Part V.

VI. WRYNECK is a peculiar distortion in which the head is bent down towards one shoulder (generally the right), and the face is turned to the opposite. The right eyebrow and right corner of the mouth generally become elevated, so as to preserve their horizontal position, notwithstanding the distortion of the neck.

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* Larrey, Clinique Chirurgicale, tom. ii., p. 81. Paris, 1829.

Varieties.—This affection presents many varieties. It may perhaps be only a part of general lateral curvature of the spine. Or, 2, it may depend on caries of the cervical vertebræ. 3. It may be caused by contraction of the cicatrix of a burn or ulcer. Or, 4, by glandular enlargement on one side of the neck; the treatment of which cases requires no observation in this place.

But the genuine wryneck is produced by contraction of one sterno-mastoid muscle, which may depend, 1, on *inflammatory* or rheumatic *spasm* of that muscle. This form generally occurs somewhat suddenly to weakly children with disordered digestive organs. The muscle is often hot and tender, and any motion causes pain.

Treatment.— Perfect rest in the horizontal posture, leeches, and poultices, or hot fomentations, so as to keep the skin constantly moist and perspirable, with purgatives and alteratives, followed by quinine.*

2. It may depend on *rigidity and atrophy* of the muscle, which may be a sequel of the state of inflammatory spasm last described, or may be congenital.

Treatment.—A long-continued course of bark, with iodide of potassium, Scott's ointment (F. 160) worn as a plaster, blisters behind the ears and to the nape of the neck, and the use of a machine to keep up extension, may be of service in cases that are of no very long duration. If they fail, as they probably will, or if the case is congenital, division of the sternal origin of the muscle (or perhaps of the clavicular also) is the last resource. It is best performed thus:—The skin covering the muscle at about an inch from the sternum is to be pinched up between the left forefinger and thumb. A narrow curved bistoury is then to be thrust under the muscle, and is to be made to divide it as it is being withdrawn; but the wound in the skin must only be large enough to admit the instrument. The aperture may be made at the anterior border of the right muscle, and between the sternal and clavicular portions of the left. So soon as the division is complete, the ends of the muscle retract with a dull snap, and the thumb should be pressed on the part, to prevent effusion of blood under the skin. When the wound is healed, but not before, an apparatus should be applied to elongate the callus, and restore the neck to its proper position. Dr. Little finds that the best way of getting a purchase on the head, so as to keep it in a proper position, is by encircling it round the forehead and occiput with a broad strip of adhesive plaster, and with a bandage over this. Another strip of plaster is put round the waist. A tape is then sewn firmly to the bandage and plaster which encircle the head, either in front of or behind the ear, according to circumstances, and should be made to pass diagonally across the neck and chest, and be fastened to the waistband on the opposite side, with the requisite degree of tightness to insure proper rotation of the head. In cases of voluntary retention of the head on one side, Dr. Little has resorted, with advantage, to painful counter-irritation on the other.*

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* For further information respecting this form of wryneck, consult Abernethy, Lecture xxxii.; James on Inflammation, 2nd ed., p. 484; Brodie on Local Nervous Affections; and Coley, Med. Gaz., N. S., vol. iv., p. 148.

3. Lastly, this distortion may be caused by *palsy* of one sterno-mastoid muscle, in consequence of which, the other muscle, being uncontrolled, drags the neck permanently to its own side. If the administration of remedies calculated to remove any existing disease in the head or back, and to improve the health, and if strychnine, blisters, and electricity fail, division of the sound muscle has been recommended.†

CHAPTER XVI.

SURGICAL DISEASES AND INJURIES OF THE CHEST.

I. PNEUMOTHORAX signifies a distension of the cavity of the pleura with air, and collapse of the lung. It is known by the following symptoms:—On the affected side there is an absence of the respiratory murmur, with an exceedingly clear sound on percussion, and immobility of the ribs; and there is *puerile respiration* on the other side. It may be caused, 1, by a fractured rib which has lacerated the lung—and in this case it is attended with emphysema, as has been detailed at p. 247. 2. It may be caused by the bursting of an abscess of the lung into the cavity of the pleura. This case will be indicated by *succussion* and by *metallic tinkling*, in addition to the signs mentioned above. *Succussion* simply consists in shaking the patient, when (inasmuch as both air and fluid have escaped from the lung into the pleural cavity) the fluid will be heard to splash, if the ear is applied to the chest at the level of the fluid. If there is fluid in the cavity of the pleura and air besides, the clearest parts on percussion will always be uppermost, in whatever posture the patient may be. The *metallic tinkling* is a clear sound, like the dropping of water into a cask. It is produced when the patient coughs, by which means a drop of fluid is shaken from the orifice in the lung, and made to fall to the bottom of the chest. 3. It may be a consequence of the escape of air from a wounded lung, after the external wound through the parietes of the chest has been closed.

Treatment.—So far as the mere surgical treatment of this symptom is concerned, if the breathing become very difficult, with a distended and tympanitic condition of the diseased or injured side of the chest, a small trocar may be introduced between the fifth and sixth ribs, to let the air escape.

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* Little on Deformities, Lond. 1853.

† Vide Cases of Wryneck, &c., by Dieffenbach, in the Lancet for Sept. 1838. Gooch gives a case of wryneck and distortion of the jaw caused by contraction of the platysma myoides, and cured by division of that muscle, in the year 1759.

II. HÆMOTHORAX, which signifies the presence of blood in the pleural cavity, may be suspected if great dyspnœa and dulness on percussion follow a fractured rib, or if it come on rapidly after closure of a wound in the chest. The blood may proceed either from the intercostal artery, or from the lung.

Treatment.—If the difficulty of breathing be very urgent, an incision must be made to let the blood escape.

III. HYDROTHORAX, or water on the chest, is indicated by great difficulty of breathing, especially on lying down—livid countenance—disturbed sleep—dulness on percussion—and if the effusion be confined to one side of the chest, there is very great difficulty in lying upon the other.

Treatment.—If the hydrothorax were merely an inflammatory effusion from pleurisy, a local affection, *paracentesis* might be advisable for the dyspnœa; but if (as it is generally) it is an effect of organic disease of the heart or lungs, the operation would do no good. At all events, both sides of the chest must not be punctured.

IV. EMPYEMA signifies abscess of the chest, or suppuration of the pleura. It is an effect of acute inflammation, whether idiopathic, or caused by injury; or else of the bursting of abscesses into the chest, or of the irritation of carious ribs. It is known by dulness on percussion, gradually increasing enlargement of the side of the chest—separation of the ribs—dyspnœa—difficulty of lying on the sound side—more or less œdema of the parietes of the chest—shivering and hectic, and the other signs of deep-seated suppuration. If left to itself, the abscess may point and burst between the ribs. *Paracentesis* is decidedly required, if the case be clear; if it be not, two or three punctures may be made with a grooved needle, or a small exploring trocar, and a cupping-glass be applied over them to extract some fluid.

V. PARACENTESIS THORACIS, or puncture of the chest, is an operation sometimes required for the foregoing affections, and especially for empyema. Wherever there is an indication of decided *pointing*, that is the place for an operation; otherwise the place usually chosen is between the fifth and sixth ribs, a little behind their middle. An incision, an inch and a half long, is made through skin and muscles, and the point of the bistoury to be passed through the pleura. If fluid escapes from this puncture, a trocar may be plunged in, or if there is no doubt in the diagnosis, a trocar may be employed at once.

It may be advantageous to employ the *drainage tube* which M. Chassaignac* has adopted for large abscesses in general, and which has been used in empyema by Dr. Goodfellow and Mr. De Morgan. This is a small India-rubber tube, with many perforations, passed through the cavity of the abscess, pleuritic or other, in order that there may be absolutely no accumulation, and that every drop of pus may be discharged, so soon as it is formed, and before it has had time to be decomposed. The first puncture or aperture is made as above described. A long bent iron probe is passed through it, into the cavity, and made to project at one of the intercostal spaces, as far back and as low down as possible. Here it is to be felt and cut down upon, and made to project; and then a piece of silk to be attached to an eye in it, which is to be drawn through the wound, and by means of the silk, an India-rubber tube; the ends of the tube are tied together, and the pus allowed to drain away.

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* See Report of Paper by Dr. Goodfellow and Mr. De Morgan, Medical Times and Gazette, 1859, vol. i., p. 659.

VI. HYDROPS PERICARDII may occur under the same conditions as hydrothorax, and may be combined with it. Its diagnosis is obscure. It may be suspected to exist if the patient complain of constant weight in the præcordia, great dyspnœa, especially when lying on the back, and faintness upon exertion; if there is great dulness on percussion, and manifest fulness over the region of the heart—if its pulsations are tremulous—and the circulation embarrassed. The operation of *paracentesis pericardii* has been practised, although it can rarely be of much benefit, and ought not to be dreamed of until blisters and diuretics have failed entirely. It has been attempted in sundry cases of hydrothorax, which were mistaken for hydrops pericardii; but by a second lucky mistake the pleura was opened instead. It may be performed either by making an incision opposite the heart's apex, and dividing the muscles and pericardium with the same precautions as in paracentesis thoracis, or by first making an opening into the pleura, opposite the junction of the fifth or sixth rib with its cartilage—and then introducing the finger, feeling for the distended pericardium, and cutting into it with curved scissors; but it is an operation which we by no means recommend.

VII. WOUNDS AND CONTUSIONS OF THE PARIETES of the chest require the same treatment, whether the ribs are fractured or not. A bandage may be applied to prevent motion of the ribs, if the patient express himself relieved by it; but sometimes it adds to the distress, and must not be used. The bowels must be opened, the diet moderately low, cough and irritation be allayed by full opiates, and bleeding or leeches be employed, if necessary, to prevent inflammation.

VIII. PENETRATING WOUNDS of the thorax, such as stabs from a sword, are usually attended with wound of the lung, of which we shall speak directly. In the dead body, when air is admitted to the cavity of the pleura, the lung collapses at once: this is certainly not the case in the living body, unless the external wound be very extensive indeed;—on the contrary, the lung continues to discharge its functions, although less perfectly in proportion to the amount of air passing in and out of the wound in the chest. The writer has had the opportunity of ascertaining that the respiratory murmur may be perfect throughout the lung, just after a wound into the pleural cavity has been closed.

Hernia of the Lung.—If the lung protrudes, the rule generally given is, to return it as quickly as possible, unless it is injured or beginning to mortify; but Mr. Guthrie recommends that it should be permitted to remain, as it closes the aperture into the pleura, and speedily granulates and heals over. Hernia of the lung, without external wound, protruding through the pleura amongst the muscles, is excessively rare, and must be treated by bandage or truss.

IX. WOUNDS OF THE LUNG, if extensive, are probably quickly fatal. If not, they will probably present the following symptoms:—Great dyspnœa and sense of suffocation; the countenance pallid and extremely anxious—and expectoration of blood, which is coughed up in florid arterial mouthfuls, mixed with occasional clots. If the wound is not extensive, there may be only a certain amount of oozing into the pleural cavity, and no cough nor bloody expectoration at all. The dangers of wounds of the chest are threefold. 1st. *Hæmorrhage*, which may destroy the patient by exhaustion, or may fill up the air-passages and induce suffocation. 2ndly. *Inflammation*, which may supervene, and will be aggravated by the irritation of clots of blood, splintered bone, or of other extraneous bodies. 3rdly. Profuse and exhausting *suppuration*, with cough, debility, hectic, and all the symptoms of phthisis.

Treatment.—The first indication is to check the hæmorrhage. If this proceed from the intercostal, or any other artery of the parietes, (although these do not often give trouble,) the wound must be enlarged, and the bleeding orifice be seized with forceps, or tenaculum, or be secured by torsion.* If hæmorrhage proceed from the wounded lung, the remedies are ice or cold drinks, perfect quietude, opium to insure sleep and diminish the respiration, astringents, as gallic acid, or alum, administered internally, and lastly, the abstraction of blood from the arm in such a way as to induce speedy syncope, if no other remedy suffices.

Secondly, the wound should be examined, and if it be of large size, or a gunshot wound, the finger should be introduced into it, to remove clots of blood, splinters of broken ribs, or any other foreign substances that it may find. If it is not sufficiently large for this purpose, it may be dilated by a probe-pointed bistoury. At the same time, an intercostal artery, if wounded, should be secured.

Thirdly, the wound should then be accurately closed with lint and plaster, or sutures, and the patient should be suffered to lie as quietly as possible. He should have plenty of cool air, and a very light covering. The rule is generally given, in all injuries of the thorax and abdomen, to place him on the wounded side; but he must decide for himself what position is the most comfortable. The closing of the wound is of necessity a great relief to dyspnœa.

Fourthly, inflammation must be combated; and if, in spite of the opium, the pulse rises, and the pain and cough and spitting of blood return, venæsection must be repeated. The diet must be proportioned to the patient's condition; beef-tea, meat and port wine in one case; iced lemonade, barley-water, or milk and water in another. But, as

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* Mr. Lawson says that the intercostal artery was not once secured in the Crimean campaign.

† See also Dr. Fraser on Penetrating Wounds of the Chest.

Mr. Lawson observes, the inflammation which follows an injury is a totally different thing from idiopathic pneumonia, and a certain exudation of healthy lymph is necessary, and should not be checked by antimony and mercury.

Fifthly, if there should be evidence that the side of the chest has become filled, and the lung compressed, by air, by extravasated blood, or by inflammatory effusion, serous or purulent, either the wound must be opened, or another incision should be made into the pleural cavity lower down.

Secondary hæmorrhage, after wounds of the lung, may, 1, be caused by inflammatory excitement; or, 2 (if the wound be gunshot), by the separation of sloughs from the lung; or, 3, by the sloughing of an intercostal artery that may have been brushed by the ball. Venæsection is the remedy for the first case, and the ligature, pressure, or styptics, such as gallic acid internally, for the latter two.

Foreign bodies in the chest add greatly to the danger of exhausting suppuration, although patients have recovered for years with balls, or pieces of cloth, encysted in the lung or pleural cavity. In some cases, a ball has remained rolling loosely about in the pleural cavity. If any foreign body is detected, it should, if possible, be removed, and part of the upper border of a rib may be sawn away with Hey's saw, if necessary, in order to get at it.

Some surgeons direct penetrating wounds of the chest not to be closed; or they even recommend tents or canulæ to be inserted, to provide for the escape of blood or matter. But it must be evident that there will be much less liability to severe inflammation if the wound is closed, just as in wounds of joints and compound fractures.

Besides, "if the patient," says Hennen, "is placed with the wound in a dependent posture, the exit of effused fluids is not necessarily impeded. If they exist in large quantity, the wound is effectually prevented from closing; if the flow is so minute as to admit of the union of the wound, the quantity effused is within the power of the absorbents to remove."

X. ABSCESS behind the sternum, and caries of that bone, sometimes require a perforation to be made in it with a trephine.*

XI. WOUNDS OF THE HEART generally prove fatal from hæmorrhage. Numerous instances, however, are on record, in which stabs or musket-wounds of this organ, have healed, both in man and animals, without any ill effects remaining. The diagnosis and prognosis will of course be extremely doubtful. The only available remedy is opium, in order to prevent hæmorrhage and keep the circulation as quiet as possible, so that the blood may coagulate in the wound, and the coagulum become adherent and organised.†

XII. DEFORMITY of the chest and spine is an almost inevitable consequence of severe pleurisy, or of empyema. The lung, compressed by pleuritic fluid, or bound down by adhesions, cannot expand again in the act of respiration, and the side of the chest falls in to accommodate itself to the crippled lung. These cases will be known by their history; by the fact that the deformity was preceded by enlargement; and by the deficient respiratory sounds which will be detected by auscultation. Mechanical appliances are of very questionable utility; but the writer has seen abundance of cases, in which, if the patient were young, and the disease not too severe and long-continued, great flattening and deformity have been completely recovered from by the unaided efforts of nature.

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* For cases, references, &c., see G. Borlase Childs, Lancet, 24th Aug. 1850; Cæsar Hawkins, Med. Gaz. N.S., vol. v., p. 62.

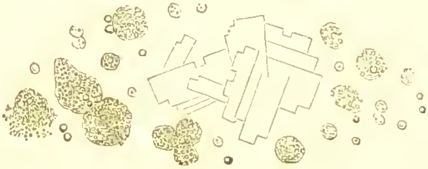
† For full information on the subject of this chapter, see Guthrie's Commentaries on Military Surgery, Lond. 1855.

CHAPTER XVII.

INJURIES OF THE ABDOMEN, AND SURGICAL OPERATIONS.

I. PARACENTESIS ABDOMINIS, an operation much better called by the Anglo-Saxon term *tapping*, is required in *ascites*, and in *ovarian dropsy*, when the abdomen has become so distended that the breathing and the circulation of the lower extremities are seriously impeded.

Diagnosis.—In the first place, *ascites* may be known by the abdomen being *equably* enlarged and fluctuating, not feeling harder at one part than at another, whilst in *ovarian dropsy*, the swelling probably fluctuates less distinctly, for it may be composed of distinct cysts, some of which feel more distended than others. If, however, the ovarian tumour consists of a single thin-walled cyst, this diagnostic mark will be absent. A second means of distinguishing the two affections is afforded by percussion. In ascites, the bowels, as they contain air, float up through the fluid; and, in whatever position the patient may be placed, they tend to occupy the uppermost part, and the fluid the lowest; and a clear sound may be elicited by percussion over the bowels, but a dull sound over the fluid. Thus, if the patient be placed on his back, a clear sound will be produced over the anterior surface of the abdominal parietes, but a dull sound towards the sides and back. In ovarian dropsy, on the contrary, the abdomen is distended by a tumour, which occupies its front part, the bowels being behind and on either side of it. Consequently, when the patient lies on her back, percussion of the anterior surface produces a dull sound; whilst a clear sound may be produced towards the back part and sides. Yet if the quantity of ascitic fluid be very large, and the abdomen be so distended that the mesentery does not allow the bowels to float up and entirely reach the anterior wall, it must be evident that this diagnostic mark may be far less palpable. Even in this case, however, the croaking of air in the bowels may be perhaps felt; and as Dr. Tanner remarks, in some MS. notes with which he has favoured the author, it is more likely that ascites will be taken for ovarian dropsy than the converse. In any case of doubtful diagnosis, therefore, the probabilities are in favour of ascites. Some degree of ascites is frequently present with ovarian dropsy. Moreover, fluid may escape into the peritoneal cavity from the ovarian tumour, as stated by Hughes Bennett. Thirdly. A microscopic examination of the fluid which is removed will, in ovarian dropsy, most probably reveal the old disintegrated blood-globules, the epithelial cells, the large compound granular masses, and heaps of granules, oil-cells, and crystals of cholesterine, which abound in the liquid of old ovarian cysts.



Lastly, there are the history and general symptoms, the uterine derangement, and pelvic tumour felt in the early stage of the ovarian disease; the impaired health, œdema of the legs, and enlargement of the liver, which probably precede ascites. Into these it is not our province to enter.

Operation.—The rule generally given is, that the patient must be seated in a chair,—that a broad towel must be passed round the lower part of the abdomen, its ends to be crossed behind and intrusted to two assistants, who are to be instructed to draw it tight and support the belly as the fluid escapes. These precautions are taken, because of the risk that the removal of the compression to which the abdominal veins have been habituated, might cause the blood to gravitate into them from the heart and induce syncope, or that perhaps they might burst, and occasion a fatal hæmorrhage. But this risk is entirely avoided if the plan be adopted of placing the patient in the recumbent posture on her side, at the edge of the bed, and turning her over as the fluid escapes; and this plan is not only safer and more convenient, but more effectual for getting rid of the fluid. But be this as it may, the surgeon, holding a trocar in a canula in his right hand, with the end of his forefinger about two inches from the point of the instrument, plunges it through the linea alba, two inches below the umbilicus; then holding in the canula with his left hand, he pulls out the trocar with his right. Modern instruments are provided with an India-rubber tube at right angles; so that the fluid may pass into a convenient receptacle, without noise or splashing. If the trocar is a large one, which is expedient in ovarian dropsy, it will be as well, before introducing it, to puncture the skin with a common lancet, or to make an incision with a scalpel. The aperture is afterwards to be closed with lint and plaster, and a broad bandage with napkins as a compress, to be applied with comfortable tightness. (See Bandages.) If a patient with ascites happens also to have an old irreducible hernia, and the sac is much distended, and preserves a free communication with the abdomen, it is a good plan to puncture the sac instead of the linea alba.

II. OVARIOTOMY.—The ovary, which, in a healthy condition, is about 1½ inch in its long diameter, and composed of peritonæal and fibrous coat, enclosing a vascular stroma filled with minute cysts, is liable to many diseases. Sometimes a solid tumour is developed in it, or a cutaneous cyst containing hair, teeth, and bone. But the disease to which the name ovarian tumour, or ovarian or encysted dropsy is given, may be described as an exaggeration of the entire organ, or of one or more of the individual cysts contained in it, into an enormous tumour, which may weigh from 50 to 100 lb., or even more. This tumour may be simple or cancerous.

In the simple, the parts composing the tumour are natural structures, only greatly hypertrophied; in the cancerous, the solid intracystic parts are composed of cancer tissue. In some cases a cancerous growth may be superadded to a previously-existing simple tumour.

The number of cysts may be one, or almost infinite, there being in the latter case a vast number of smaller ones developed in the interstices, and projecting into the cavities, of the larger ones. They may be thin and flexible like bladder, or thick and semicartilaginous. The contained fluid may be clear and transparent as pure water, or thick and ropy, from the presence of a peculiar extractive matter; or may be of a deep coffee colour from the presence of broken-down colouring matter of the blood; or opake, from the presence of the matters shown in the preceding page. The ovarian fluid contains much less albumen than blood serum does, and no phosphate of soda, or but very little.*

The *diagnosis* from ascites has been spoken of already. From pregnancy it must be distinguished by its history and duration, and especially by the physical condition of the uterus, as ascertained by examination. For a more detailed history, and its diagnosis from other growths within the abdomen and pelvis, we must refer to obstetric writers, our concern being only with the treatment by operation.

Once in existence, three courses are open to this disease. 1. It may subside after tapping, or after accidental rupture of the cyst into the peritonæal cavity. The latter event, however, has proved fatal through peritonitis in some of the instances in which it has been noticed. In some cases relief, more or less great, has followed the ulceration of the tumour, and the discharge of its contents through the navel or into some part of the bowels. But each of these cases is rare.

2. The disease, although incurable, may remain stationary, the system become habituated to it, and life go on almost as though the burden existed not. The writer in former editions, mentioned the case of a lady, aged about 60, of tall commanding figure, in whom an ovarian

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* Analysis by Dr. G. O. Rees, quoted in Dr. A. Farre's article Uterus, in Todd's Cyclopædia.

tumour, of immense size, has existed for more than thirty years. Her health had been for years pretty good, although when the disease first made its appearance, before the diagnosis was fully made out, she suffered for three years from all the remedies that the physicians of George the Fourth's time could devise for the dispersion of the swelling. Since the last edition she died of suppuration of the cyst.

3. But unhappily such cases as these are the exceptions. In by far the greater number the tumour continues to increase; fills up the abdomen; interferes with the breathing; makes the patient's existence a misery; and at last wears her out from pain and irritation. This fatal issue will be, of course, much quicker if the malady is of a cancerous nature; in which case, instead of remaining free and unattached in the peritonæal cavity, or even instead of being bound down by more or less numerous bands of adhesion, the tumour becomes amalgamated with the abdominal wall, with the liver, and with other viscera, and communicates a cancerous infiltration to every part that it adheres to. The question then is, what can our art do to cure the patient, or to mitigate her sufferings; and there are three things that require mention, viz., 1stly, tapping; 2ndly, various medical and surgical measures adopted in the hope of producing atrophy of the tumour; and, 3rdly, extirpation, or ovariotomy.

1. *Tapping.*—This is the simplest mode of procuring relief; and in some few cases the tumour, emptied by this means, continues quiescent for years or for life. But far more commonly the operation requires to be soon repeated. Cases are extant, in one of which the patient lived to be tapped 66 times at intervals of about a month; and, in another, 128 times at intervals of six weeks; but taken as a general rule, it may be affirmed that few patients survive more than four years after the first tapping, a period passed in the greatest misery and suffering. We may add, that in order to relieve the patient effectually, it may be necessary to use a very long trocar, and to plunge it quite deeply, so as to reach the more deeply-seated cysts; and that the puncture had better be made wherever fluctuation is most evident. Tapping *per vaginam,* when a fluctuating portion of tumour projects much in that situation, may be worth adopting.

2. Under the second head may be enumerated an immense variety of plans for producing atrophy or absorption of the tumour; such as (*a*) the administration of the iodide of potassium, with tonics, and the iodide of iron: these should have a fair trial in incipient cases, and after tapping: in cases in which the author has been consulted, he has always found a tonic plan of treatment the most effectual. Considering the enormous amount of blood-cells, albumen, and other blood-stuff in the fluid contents of the tumour, the writer has suggested the administration of gallic acid and the other vegetable astringents. As for mercury and remedies whose object it is to promote absorption by creating great evacuations, or by lowering the system, the writer can only say that he believes the less they are resorted to the longer the patient will live. (*b*) Mr. Isaac Baker Brown's plan of first emptying the cyst by

tapping, then applying firm pressure and administering mercury. (*c*) Operations for opening the cyst into the cavity of the peritonæum by subcutaneous section, thus imitating the cases in which the cyst has been ruptured by violent action of the abdominal muscles, and the fluid has been absorbed, and the patient cured. But of course, for the success of such operations, it is requisite that the active growth of the tumour be at an end. (*d*) Operations for causing the tumour to waste and suppurate by passing setons. (*e*) Procuring adhesion of the cyst to the abdominal parietes, and establishing an ulcerated opening into the cyst at the adherent spot; or cutting into the cyst, and stitching the edges of the opening into it to those of the wound through the abdominal parietes; thus establishing an *artificial oviduct*, through which the contents of the cyst may be evacuated. Most of these plans were originated by Mr. I. B. Brown. (*f*) The *iodine injection* has been tried by Dr. Simpson with good results; and by Mr. Spencer Wells. The latter gentleman prefers a solution of 20 grains of iodine and 30 of iodide of potassium, in an ounce of distilled water, to the strong tincture of the Edinburgh Pharmacopœia, which Dr. Simpson employs. About two fluid ounces of this solution are injected after the cyst has been completely emptied. The same precautions are necessary as in the injection of the tunica vaginalis, not to let the point of the trocar slip out of the cyst, so as to run the risk of injecting the fluid into the peritonæum. For this purpose a catheter may be passed through the canula of the trocar, deep into the cyst, before the fluid is let out, and be held there. The iodine is injected, or allowed to run in through a glass syringe, and is suffered to remain. If it answers the desired end, it will destroy or modify the inner surface of the sac, take away its secreting power, and cause the cyst to wither. The pain which follows the injection may be relieved by opium, and fomentations. But it stands to reason that this is not a *radical* remedy, and that it is not a safe remedy, unless there be but one cyst. To ascertain the last point, Dr. Graily Hewitt uses an exploring sound, which may be passed into the interior of the cyst, through the canula of a trocar; which is provided with an india-rubber diaphragm to prevent the escape of the liquid, till the whole interior of the cyst has been explored.* (*g*) There is another operation of fair promise which has been proposed by Dr. Tanner, for cases in which the presence of extensive adhesions renders it impossible to remove the cyst. This consists in tying tightly the pedicle of the tumour after the fluid has been removed by tapping. Thus it may be hoped, that whilst the supply of blood furnished to the cyst by its adhesions will be sufficient to prevent gangrene, the obstruction of the main arterial channel might prevent the fluid from being secreted anew.

3. *Ovariotomy.*—The remaining remedy is extirpation. Against which may be adduced, 1st, the *difficulty of diagnosis*, insomuch that

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* See remarks by Dr. Simpson, quoted in Prov. Med. Journ., 1854, p. 1067; case by Spencer Wells, and description of Dr. Graily Hewitt's instrument, Med. Times, 1859, vol. I., p. 549.

out of eighty-one cases collected by Mr. B. Phillips in 1844, in which it had been attempted, no tumour whatever was found in five, and in six others the tumour was not ovarian; 2nd, the fact that in fifteen out of the eighty-one cases, after the abdomen was opened, extirpation of the tumour was found impracticable, in consequence of the numerous *adhesions* which bound it to neighbouring parts;* 3rdly, the *mortality*. Of the eighty-one cases, forty-nine recovered, thirty-two died. Of the sixty-one in which the tumour was extracted, thirty-five recovered, twenty-six died. Of the fifteen in which the tumour could not be extracted, nine recovered, and six died. Dr. Robert Lee, in 1853, enumerates one hundred and sixty-two cases, out of which the tumour could not be removed in sixty; of these nineteen fatal: of one hundred and two cases in which the tumour was removed, there were forty-two deaths. On the other hand, in favour of the operation, it may be argued—1st, that the mortality arising from this is not larger than that from many other surgical operations; and, to use the words of Mr. Southam, the statistical argument is singularly inconsistent when used by surgeons who do not hesitate to recommend operations still more dangerous, for the removal of diseases not immediately fatal; as, for example, ligature of the innominata artery for aneurism; an operation that has always proved fatal. Out of seven cases, Mr. Spencer Wells has preserved the lives of five. 2ndly, that no other plan of treatment can effect a radical cure, but that by this, women, relieved of a burden which made life miserable, have married and borne children. 3rdly, that if favourable cases only were submitted to operation, the mortality would be very small, and that increase of experience will lead to the selection and discrimination of favourable cases, and to improvements in the operation; such, for example, as the bringing of the peduncle out of the wound, instead of leaving it to slough within the abdomen. 4thly, that if the surgeon, in order to complete his diagnosis, makes a small incision, to ascertain the existence of adhesions, and closes it again with suture if he finds this to be the case, no great harm is likely to result; in fact, this, which is sometimes raked up as an opprobrium against operators, is a prudent and legitimate measure. Lastly, that it is by far the *most merciful* plan of treatment, if adopted early, in patients otherwise healthy, with a still growing but nonadherent tumour.

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* Out of four patients operated on by Mr. Lizars some years ago, one died; one recovered; in one, after the abdomen was laid open, there was found to be no tumour at all; and in the fourth there was discovered an enormous mass of convoluted vessels looking like a placenta, which proceeded from the omentum to the tumour, and of course rendered extirpation quite out of the question, so that the incision was closed again. Mr. Solly, in a Lecture in the Med. Gaz. vol. xxxviii., states that the deaths from ovariotomy up to 1846 were only one in three and a half. Dr. Tilt, Lancet, 1848, vol. ii., p. 626, gives sixty-one cases, which occurred in the practice of five individuals. Of these, it was impossible to remove the tumour in eleven; of which eleven, seven recovered and four died. Of fifty cases in which the ovary was removed, thirty-seven recovered and thirteen died. In a series of interesting and important papers on the subject in the Med. Times for 1859, vol. i., it is stated that, out of twelve cases operated on in London in 1858, the tumour was not removed in two; of which one was fatal in a fortnight, the other in four months: of the ten patients from whom the tumour was removed, seven were living, and six in excellent health, at the end of the year.

In a field where so many have distinguished themselves, it would be impossible to mention all, and unfair to select a few of those who have acquired celebrity for their skill and success in this operation; yet the writer cannot refrain from adducing the names of Mr. Lane, Dr. Clay, Mr. Southam, Mr. Walne, Dr. Frederic Bird, Mr. Jeaffreson of Framlingham, Mr. West, Mr. Crouch of Bruton, now of Mitcham, Mr. I. B. Brown, Dr. Tanner, and Mr. Spencer Wells.

The surgeon who proposes to himself to perform this operation, should make certain, 1st, that a tumour exists, and that it is ovarian; 2ndly, that the tumour is increasing, and likely to destroy life, if allowed to remain. No one would interfere with a stationary tumour. 3rdly, that the increase of the tumour is not arrested by tapping, moderate pressure, and iodine or iron. One tapping is always expedient, as a means of diagnosis, because if the empty sac subsides into the pelvis, it is a guarantee against extensive adhesions. 4thly, that the disease is not cancerous. Cancer may be suspected if the tumour has begun early in life, is increasing very fast, and is adherent, and if there is great pain, and decay of health and strength. 5thly, that the general health is such as would be desired in any patient who was to undergo a capital operation; lastly, he should ascertain whether there are extensive adhesions to the abdominal parietes or viscera. This he may do in some measure by noticing whether the tumour shifts its place as the patient rolls herself from side to side, and also by a very ingenious test which the author has seen used by Dr. F. Bird; namely, by putting the abdominal muscles in action, and noticing whether they rise much from the surface of the tumour. Thus, if the patient whilst lying on her back be told to raise herself up in her bed without using her arms, the recti muscles will start up into a prominent band, if their sheath is *not* bound down by adhesions on its peritonæal surface, but not if it is. By observing also, as Dr. Sibson suggests, whether the tumour descends during inspiration; and by grasping and endeavouring to slide the abdominal parietes over the tumour, or to grasp them and lift them from the tumour, much valuable information will be derived; but the decisive test is a short incision, and exploration with the finger.

The reasons for running the risk will be much the strongest in the case of a young healthy person, whose life, if spared, might be long and valuable.

The *operation* comprises the following steps. The patient ought to have the bowels and bladder empty, and to have taken food three hours previously. The temperature of the operation room should be raised to about 70°, and the air should be moistened by the vapour of water. The patient's position should be easy, and chloroform should be administered.

The most happy method of operating, supposing that the circumstances admit of it, is, to make a short incision, say from four to six inches, between the umbilicus and the pubes, along the linea alba, through the peritonæum. Next to puncture the cyst, and empty it; and for this purpose to employ a very large trocar devised by Mr. Hutchinson, so as to get through the process as quickly as possible. Then to drag out the emptied and collapsed cyst, seizing it with hooked forceps, or running a ligature through it. In the next place, to separate the tumour from its pedicle, and secure the divided tissues, so that there shall be no internal bleeding, which is one great source of danger after the operation. At the same time it is one of the greatest modern improvements that the divided pedicle shall not be put back within the abdomen, where it may possibly bleed, and certainly suppurate before the ligatures separate; whilst the ligatures themselves keep the wound open, and favour the spread of inflammation; but that it shall be brought out of the wound and be fixed there. This improvement is due to Mr. Duffin. For this purpose the pedicle may be compressed by a clamp, originally devised by Mr. Hutchinson, consisting of two parallel plates of steel, which in the most improved form of the instrument are gilded, and are capable of being screwed together at either end, so as to compress the pedicle equally.* The inner surface of each plate is jagged, so that the pedicle can scarcely slip. It should, as Mr. Spencer Wells observes, be so placed as not to drag the uterus, and consequently should be as far from that organ as possible; and if the pedicle be very short, a portion of cyst may be cut off, sufficient to make a pedicle long enough to project through the wound. Lastly, the wound is closed accurately (leaving the stump of the pedicle secured by the clamp just protruding from it), and so the operation is finished.

The method of closing the wound recommended by Mr. Spencer Wells, is by a sufficient number of harelip pins with twisted suture, or by silver wires; and the wires or pins should be passed through the entire thickness of the wound, including the peritonæum, so as to bring two surfaces of that membrane into contact, and produce adhesion of them, and exclude the contact of the purulent matter which may be secreted by the other structures.

But there are cases in which the steps of the operation do not follow so smoothly as we have just described them. The abdomen may contain a large quantity of ascitic fluid, most of which must be allowed to escape before beginning upon the ovary. It may not be possible to extract the tumour through a small incision, either because its contents are too viscid to run out, or because it is solid and cannot be emptied (of course any lesser contained cysts may be punctured), or because of adhesions. These, if old, firm, and extensive, may cause the operation to be abandoned; if slighter, they may be gently torn through, or, if need be, divided with the knife, and any arteries or veins of sufficient consequence must be tied. If it be impossible to apply the clamp, a stout whipcord ligature may be made to encircle the whole pedicle;

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* Described in Medical Times and Gazette, Dec. 11, 1858.

and even then, some single vessels may require to be tied. The remaining ovary should be examined, and if diseased may be removed; but the patient should not needlessly be *spayed*. One steady assistant should take charge of the edges of the wound, holding them close to the cyst, so that the bowels shall not protrude between; flannels steeped in water at 98°, should be at hand to protect them if need be.

The patient should be kept thoroughly warm during the operation, by flannel stockings, and bottles of hot water to the feet; and the abdomen be afterwards padded with the softest cotton wool, and supported by a many-tailed or Indian bandage. Morphia may be administered in regular small doses, to procure sleep by night and ease by day. Sickness and thirst may be allayed by sucking ice. The diet should be good, consisting of soup, light pudding, and wine or brandy and soda water, according to the patient's taste. The bowels should be regulated as they are after a confinement; that is, having been well emptied before the operation, they need not be disturbed till they begin to feel uncomfortable; then a lavement may be administered. The catheter should be introduced regularly. If great pain and tenderness come on, a common warm linseed poultice may be applied, as suggested by Mr. Wells; and if serous effusion should be produced by peritonitis, he very rationally recommends that the wound should be partially opened to let it escape, as he did in one case, with the best possible results; for, as he observes, the serum in this case was so acrid that it scalded the fingers; and there is no doubt but that it would have been capable by inoculation of producing puerperal fever: what mischief, then, must it not cause within the peritonæal cavity?

III. VIOLENT BLOWS ON THE ABDOMEN from obtuse substances, the passage of cart-wheels, spent shot, and so forth, may produce various results. 1. They may cause severe *concussion* and collapse, which may either speedily prove fatal, or may pass off without further ill consequences, or may be succeeded by inflammation.

2. They may produce *laceration* of the bowels, or of the solid viscera; with effusion of blood or of their secretions into the peritonæal cavity. This may be suspected if the patient complains of excruciating pain radiating over the whole belly; if the features are pinched, the belly soon swells, and the pulse is very small and tremulous.

Treatment.—The patient must be suffered to lie quietly during the stage of collapse, without any officious administration of stimulants; and so soon as pain or vomiting comes on, he should be bled. Subsequently bleeding, or leeches, and fomentations to the belly, to abate inflammation; and large doses of opium to support the system under the irritation, are the only available remedies. The bowels should not be disturbed either with purgatives or enemata for the first three days, nor should any nutriment be taken, save very small quantities of the mildest fluids at intervals.

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* See Lizars on the Extirpation of Diseased Ovaria, Edinburgh, 1825; J. Hughes Bennett, Ed. Med. and Surg. Jour. April, 1846; B. Phillips, Med. Chir. Trans. vol. xxvii.; Dr. R. Lee, on Ovarian and Uterine Diseases, Lond. 1853; Dr. Tilt, Lancet, 1849 and 1850; Mr. I. B. Brown, on Diseases of Women, Lond. 1854; Southam on Ovariotomy, Prov. Jour. 1845, and Transactions, 1847; Dr. Tanner, in the Lancet for 1852, vol. ii., and Med. Times for 1853, vol. i.; C. R. Thompson of Westerham (describes the improved trocar mentioned at p. 496), Med. Times, 1858, vol. i., p. 329; Spencer Wells in Med. Times and Gaz. for 1858 and 1859.

IV. ABSCESSES between the abdominal parietes occasionally result from contusions or punctured wounds, and sometimes occur idiopathically. According to the principles laid down in the chapter on Abscess, they should be opened early, both because of the tendinous structures by which they are covered, and of the possibility that they might burst into the peritonæum.

V. PENETRATING WOUNDS of the abdomen may be divided into four species: namely, 1st, simple wounds of the parietes; 2ndly, wounds of the viscera; 3rdly, wounds of the parietes with protrusion of the viscera; and, 4thly, wounds in which some of the viscera are protruded and wounded likewise.

1. In the case of a *simple wound of the parietes*, the surgeon must first (if it be large enough) gently introduce his finger, to ascertain that no part of the intestines is beginning to protrude; then the wound must be closed by sticking-plaster; or by suture, if it is extensive. If the epigastric artery is divided, it must be cut down upon and tied. The surgeon must recollect that when any part of the abdominal parietes has been wounded or severely bruised, it is almost certain afterwards to become the seat of hernial protrusion.

2. *Wounds of the viscera.*—In the case of small wounds of the abdomen without protrusion, it will be often impossible to say whether the bowels are wounded or not, but the treatment must be altogether the same, whether they are or not.

(*a*) Wounds of the *stomach* may be known by the situation and depth of the wound, by vomiting of blood, by the very great depression and collapse, and by the nature of the matters (if any) that escape from the wound.

(*b*) Wounds of the *bowels* may *perhaps* be known by the passage of blood with the stools, or by fæcal matter escaping from the wound, or by the symptoms of extravasation of their contents into the abdominal cavity—that is to say, excruciating pain, radiating over the whole belly from the seat of the injury, and attended with signs of great collapse. Fortunately, however, as Mr. Travers has shown, wounds of the stomach and intestines, unless very large, are not so liable to be attended with extravasation as was formerly thought. For, in the first place, the mucous membrane protrudes through the muscular, so as to fill up a small aperture; and, secondly, any tendency to extravasation is counteracted by the constant equable pressure of all the abdominal viscera against each other. Moreover, lymph is soon effused, and glues the neighbouring parts togéther, and thus the aperture is circumscribed, and any future extravasation is prevented.

(*c*) Wounds of the *liver*, if extensive, are, from its great vascularity, nearly as fatal as those of the heart. Small wounds may be recovered from. There will at first be symptoms of great collapse, which, if the patient survive, will be succeeded by severe sickness, pain in the liver, yellowness of the skin and urine, great itching, and a glairy, bilious discharge from the wound.

(*d*) Wounds or rupture of the *gall-bladder* are almost invariably fatal, although there are one or two instances of recovery on record.

(*e*) Wounds of the *spleen*, if deep, are also fatal, from the great hæmorrhage that follows, although the whole organ has been removed from animals, and from man, without much consequent evil.

(*f*) Wounds of the *kidneys* are attended with bloody urine. They are exceedingly dangerous, first from hæmorrhage, next from violent inflammation with excessive vomiting; and, lastly, from profuse suppuration, kept up by the passage of urine through the wound. Venæsection, very mild laxatives, the warm bath, very light dressings, so as to admit of the flow of urine through the wound, and some unctuous application to prevent excoriation of the surrounding skin, are the necessary measures.

(*g*) Wounds of the *bladder*, if communicating with the peritonæum, are extremely dangerous, owing to extravasation of urine. In fact, unless there is an external wound through which it can escape, they are almost uniformly mortal. The catheter must be worn constantly. Mr. Syme (in his "Contributions") gives a case of rupture of the bladder below the line of reflection of the peritonæum, in which the patient recovered, free incisions having been made to give exit to the urine which was extravasated between the abdominal muscles and skin.

3. *If the intestines protrude*, and are neither wounded nor gangrenous, they should first be freed from any foreign particles that stick to them, and then be returned as soon as possible. The patient should be placed on his back, with his shoulders raised, and his knees drawn up. If absolutely necessary, the wound must be a little dilated with a probe-pointed bistoury. Then the surgeon should return the bowel portion by portion, passing it back with his right forefinger and thumb, and keeping his left forefinger on that which is already replaced, to prevent it from protruding again. He should be careful to replace intestine before omentum, and the part that protruded last should be returned first.

4. If the stomach and intestines, when *protruded, are found to be wounded*, it is usually directed that the wound shall be sewn up. (See p. 145.) Then it is hoped that the aperture in the bowel will be united by the adhesion of contiguous surfaces; and the silk employed in the suture will be detached by ulceration, and fall into its cavity. If, however, any part of the bowel that is protruded be very much lacerated, or be gangrenous, it should not be returned, but be left hanging out, that an *artificial anus* may be formed.

The symptoms of *inflammation of the peritonæum* or abdominal viscera, which is of course exceedingly likely to follow these wounds and injuries, may readily be recognised. The patient lies on his back, with his knees drawn up; he breathes solely with the thorax, and not with the diaphragm or abdominal muscles; the countenance is anxious;

the pulse small, wiry, and resisting, but becomes fuller after bleeding; there is severe throbbing pain, with great tenderness, more or less widely diffused; a dry tongue, constant nausea, or vomiting, and obstinate constipation, complete the catalogue. If the case proceeds to a fatal termination, the belly swells, partly from serous effusion, partly from tympanites; and the pulse becomes more frequent and weak, the patient retaining his senses to the last.

The *treatment* comprises rest; opium or morphia, which may be given as enema; fomentations; leeches if necessary; ice to allay sickness; and cold beef-tea by spoonfuls.

It is quite unnecessary to give purgatives in cases of inflammation of the bowels. It is true that the bowels will be obstinately costive; but this costiveness arises from their being inflamed, and unable to propel their contents onwards; and the proper remedies for it are such as will relieve the inflammation—that is, bleeding, leeches, fomentations, and calomel and opium. But if, in spite of common sense, the surgeon attempts to overcome the costiveness by colocynth pills and black draughts, he will soon induce obstinate vomiting, that will render all his other remedies nugatory. If in any case of inflammation of the bowels it is probable that they are loaded with fæces, the proper remedy is the repeated injection of warm water as an enema.*

VI. ARTIFICIAL ANUS signifies a preternatural communication between the intestine and skin. It may be a consequence of penetrating wounds, of abscess or ulceration of the intestines, or of mortification of intestine in strangulated hernia, and it is sometimes purposely made by the surgeon in case of imperforate anus, in order to afford an exit for the fæces. The external opening is irregular, everted, and red, and the surrounding skin excoriated. The aperture in the intestines adheres by its margin to the peritonæum, so that extravasation into the abdomen is prevented. That portion of intestine which is immediately above the aperture, and that portion which is immediately below it, meet at the artificial anus at a more or less acute angle, and present two orifices; one by which matters descend from the stomach, and another which leads down to the rectum. These two orifices are separated by a sort of crescent-shaped septum, formed by a projection of the mesenteric side of the bowel opposite to the aperture. Now it may readily be understood that the greater the aperture in the bowel, the more acute will be the angle at which the upper and lower portions meet, and the greater will the septum also be; and that, if the septum is large, it will act as a valve, and close up the orifice of the lower portion of bowel, causing any matters that come down through the upper portion to escape externally, instead of passing into the lower.†

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* See Travers on Wounds of the Intestines, Lond. 1812: Hennen's Military Surgery; the observations on the treatment of Enteritis in Ferguson on Puerperal Fever; Griffin's Medical Problems; Holland's Notes and Reflections; and Dr. Watson's Lectures.

† See the Chapter on Artificial Anus in Lawrence on Hernia, and Dupuytren in Dict. de Méd. tom. iii.

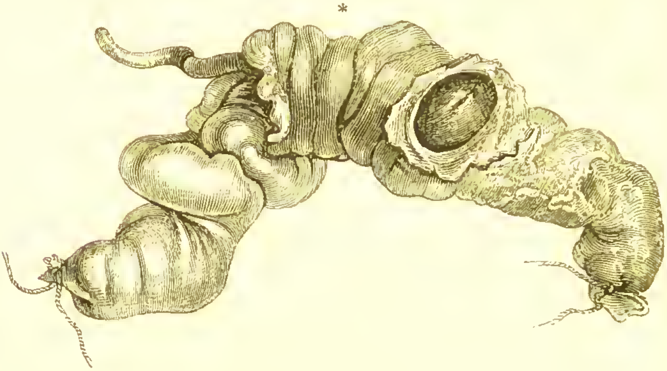
The *consequences* of this affection may be, 1st, that the patient may die of starvation, from the escape of the chyle, if the aperture is near the duodenum. 2ndly, that a portion of the intestine may protrude and form a hernia; besides the constant disgusting annoyance occasioned by the escape of fæcal matter and flatus.

Treatment.—If the affection is of recent origin, and especially if it is consequent upon strangulated hernia, the patient should remain in bed, and great care should be taken to keep the parts clean; and then, perhaps, the external aperture may contract and cicatrize. If the latter is very small, and if the passage between it and the bowel is of some length (a state of parts termed *fæcal fistula*), something may perhaps be done by compression, or by engrafting a piece of skin over the aperture; or by making an oval incision in the skin on each side of the aperture, and bringing the outer edges of the incision together by means of needles and the twisted suture; or by applying the actual cautery to the margin of the wound.

But if the loss of substance in the bowel is considerable, and the projecting septum large, the chance of recovery is not great. A pad of simple linen or lint may be worn to compress the aperture, and prevent discharge from it, or sometimes a hollow truss with a leathern or horn receptacle, may be used with advantage. Enemata are useful in all cases. Moreover, a tent may be thrust into both internal orifices, in order to enlarge the lower one, and repress the septum, as proposed by Dessault. As a last resource, a small portion of the septum may be nipped and strangulated by the forceps invented by Dupuytren for that purpose.

VII. ABDOMINAL SECTION.—There is a class of cases of obstruction of the intestines, in which it is found, after death, that the mischief has been done by some one little band, and that if this could have been found and severed, the patient might have had at least a chance of recovery.

Intestinal obstruction may, however, arise from many other *causes*; such as, 1st, *ileus*, or obstinate spasm; 2ndly, impaction of accumulated fæces, or, perhaps, of a large gall-stone; 3rdly, solid growths within the intestine; 4thly, tumours pressing upon it from without; 5thly, stricture of the intestine; 6thly, invagination, or the slipping of one portion into, and constriction by, another. This condition is rarely recognised in time, and is often mistaken for dysentery, and the writer believes that many children die of it, without the true cause being known. The child is ill, probably vomits; is evidently in pain in the bowels, and usually passes the contents of the bowels mixed with more or less blood; afterwards blood alone. Most probably the parents send for medicine, and possibly get a powder containing some strong purgative, which makes the case worse or hopeless. The symptoms of strangulation continue; and if the patient survive long enough, there is a discharge of fetid bloody serum oozed out by the strangled bowel, and possibly a portion of bowel may be passed down to, and protrude from the anus. In some desperate cases, the strangled part has bodily sloughed off, and been voided; the continuity of the canal has been established again, and the patient has recovered. The best remedy is opium.



Lastly, constriction by bands of lymph; or by rents in the mesentery through which the bowel has slipped; besides internal hernia; obturator hernia, for example. Moreover, from whatever cause arising, the *symptoms* are usually much the same—viz., obstinate constipation; a vomiting first of a yellowish or greenish liquid, then of a feculent or stercoraceous matter; and occasional fits of colicky pain—arising from the efforts of the intestine to overcome the obstacle, during which the coils of the distended guts can be seen through the abdominal parietes. To these essential symptoms, tenderness, and other signs of inflammation are added in greater or less degree.

Now the practical question arises—suppose there were to be a case of evident mechanical obstruction of the bowels; that injections have been used as largely as they safely can; and that purgatives have been given till they do but add to the distressing vomiting; that leeches and opium and hip-baths have been resorted to for the relief of tenderness; and that some space has been given, if the symptoms are not very urgent, to see what nature unaided can do, and that the case remains unimproved—shall the patient be left to die? or shall surgical means be resorted to, to give him a chance? The author would say, let the patient settle his affairs, worldly and spiritual, and let an operation be resorted to.

The most favourable circumstances which such a case can present are, if the patient is not too much exhausted by a long continuance of pain and vomiting; if he can point to any one spot as the seat of uneasiness, and, probably, of stricture, and if an examination of the distended coils of intestine seems to confirm this suspicion; and if he has been known to suffer on former occasions from an attack of inflammation in the abdomen, thus making it probable that the obstruction is caused by bands of lymph, rather than by either of the other causes; and if the present attack have come on suddenly.

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* Invagination of the intestine, from nature, by Dr. Westmacott. A large coil of the small intestines, including the caput coli, has been engulfed within the ascending colon. The vermiform appendage is seen projecting out; and through an aperture, made artificially, the black and almost gangrenous intestine is seen strangled within.

If the operation is determined on, the air of the apartment should be raised to about 70°; flannels dipped in warm water should be ready to protect the bowels if they protrude; chloroform should be administered, and the bladder emptied. Then an incision should be made through the linea alba below the umbilicus; the peritonæum be carefully opened, and the finger at once passed to the probable seat of obstruction. If a band is found, the finger must be passed under it, and a probe-pointed bistoury used to sever it, the wound should be closed with abundance of sutures, and a compress and bandage be placed over it. In one of the cases in which the author has operated, the patient pointed beforehand with perfect accuracy to the spot where the obstruction was found.

Should the operator either fail in finding an obstruction, or in relieving it, the desperate resource remains of opening the bowel, as low down as possible, and stitching the opened part to the edge of the wound in the parietes so as to establish an artificial anus.*

VIII. ARTIFICIAL ANUS FOR THE RELIEF OF OBSTRUCTION.—When an obstruction of the bowels is situated in the rectum or colon, and the passage of fæcal matter is entirely prevented, so that life is in imminent danger, it is the surgeon's duty to propose an operation for the patient's relief.

The *class of cases* referred to, comprise, 1, cases of *congenital* deficiency of the rectum in new-born children, in which an attempt has been made unsuccessfully to open the bowel from the perinæum; 2, cases of impassable *stricture* of the rectum, or of some part of the colon; 3, of obstruction by cancerous and other growths within, or tumours without; or, in fact, by any other conceivable cause.

Before resorting to such an operation, the surgeon must first explore the rectum thoroughly by finger and bougie, inject water by the long tube, and take every other method of establishing an accurate diagnosis, since, of course, to make an opening below the point of stricture would be useless. Then there are two places in which the operation may be performed:—

(1.) The *sigmoid flexure* of the colon may be opened by an incision in the left iliac region. This operation was proposed by Littre in 1720. Instead of opening the sigmoid flexure on the left, the cæcum on the right side may, if deemed expedient, be opened by an oblique incision near the anterior superior spine of the ilium.

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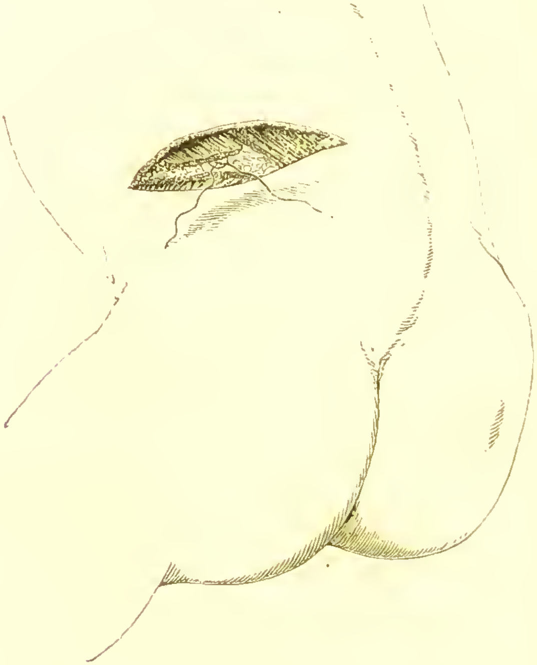
* See a most able and comprehensive paper by B. Phillips, Med. Chir. Trans., vol. xxxi., containing copious bibliographical notices, and a *catena* of opinions; an account of a case by R. Druitt, in the same vol.; and of others by Dr. Golding Bird and Mr. Hilton in vol. xxx.; by Fergusson, Lancet, 1850, vol. i., p. 128. Also a most practical paper on complications of hernia, and obstruction of the bowels, with numerous engravings and cases, by R. R. Robinson of Camberwell, from whom the author is glad to acknowledge that he has received much valuable information. Lond. Journ. of Med., 1851.



(2.) The colon may be opened in the *lumbar region* by a vertical incision along the outer edge of the quadratus lumborum, just above the crest of the ilium, as was proposed by Callisen in 1817, or by the horizontal section proposed by Amussat in 1832. This is generally called Amussat's operation. An incision through skin and fat may be made horizontally above, and parallel to, the crest of the ilium, commencing near the spine, and carried outwards for from two to five or six inches, according to the age and bulk of the patient. Taking the interval between the external oblique and latissimus dorsi muscles as a guide,—perhaps meeting the musculo-cutaneous lumbar nerves,—the surgeon carries his incision through muscles and fascia, so as to come on the bowel at its posterior part, where not covered by peritonæum. When the loose renal fat which is usually found here has been divided (or portions of it removed), so as fairly to bring the bowel into view, two ligatures must be passed through it, above and below, so as to steady it when opened, and to attach the edges of the opening in the bowel to that in the skin when the operation is completed. This must be done likewise when the sigmoid flexure is opened in front; and particular care should be taken to secure the edges of the wound into the bowel, so that no effusion can take place into the peritonæum. The right or left lumbar region must of course be selected, according to the situation of the stricture.

If the patient recovers, he should be provided with a smooth ivory plug, attached to a metallic or India-rubber plate, and secured by a truss or bandage, for the double purpose of preventing the escape of fæces at inconvenient times, and of preventing the aperture from contracting, and so refusing a free vent to their discharge.

The ultimate fate of the patient will depend in great measure on the nature of the disease which required the operation, and on the effects which this may have already caused. Out of forty-eight cases collected by Mr. Hawkins, there is scarcely one in which death can fairly be said to have been caused by the operation itself.[*]

IX. GASTROTOMY FOR THE RELIEF OF STARVATION.—In a case of cancer of the œsophagus, in which life was at the point of extinction by starvation from utter impossibility of swallowing; in which the trachea even had been opened for the relief of the breathing, and in which the rectum, as it always will in time, ejected the materials introduced as nutritious enemata, Dr. Habershon caused an aperture to be made into the stomach, through the left linea semilunaris, which was skilfully effected by Mr. Cooper Forster. Eggs, milk, and other articles of nourishment were introduced, and the man lived till the third day after the operation, with his sense of starvation relieved, and then expired in comparative comfort.[†]

X. In a case of acute inflammatory disease of the APPENDIX CÆCI, arising apparently from the impaction of a small mass of feculent matter, Mr. Hancock made an incision close above Poupart's ligament into the abdominal cavity, and gave issue to some offensive serum, to the great relief of the patient, who was moribund, but recovered. He proposes a similar operation for the purpose of letting acrid effusions drain away, in cases of unhealthy peritonitis, and the hint is a valuable one.[‡]

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[*] Almost all that is known of these operations is summed up in a paper by Mr. Cæsar Hawkins, Med. Chir. Trans., vol. xxxv., which contains copious references to the original memoirs of Amussat, Pring, Maitland, Teale of Leeds, Evans of Derby, Clement of Shrewsbury, Baker of Birmingham, and other English and Continental operators. Notes of a good case in which it was performed by Mr. Hutchinson, for obstruction by cancerous tumour following ovariotomy, Med. Times, 1859, vol. i., p. 11.

[†] Quoted in Ranking, vol. xxviii., from Guy's Hosp. Rep., vol. iv. 3rd Series.

[‡] A short account of disease of the Appendix Cæci, cured by operation; by Henry Hancock. Lond. 1848.

CHAPTER XVIII.

HERNIA.

SECTION I.—NATURE AND CAUSES OF HERNIA GENERALLY.

Definition.—Hernia signifies a protrusion of any viscus from its natural cavity. But the word, used by itself, is restricted to signify protrusion of the abdominal viscera.

Causes.—The formation of hernia may be readily understood by considering that the abdominal viscera are subject to frequent and violent pressure from the diaphragm and other muscles by which they are surrounded, a pressure which tends to force them outwardly against the parietes of the abdomen. If any point of the parietes be not strong enough to resist this pressure, some portion of the viscera may be forced through it, and form a hernial tumour externally.

The *predisposing* cause of hernia, therefore, is a weakness of the parietes of the abdomen, which may be produced by various circumstances. Thus, 1. Some parts of the parietes are naturally weaker than others, especially the inguinal and crural rings, and the umbilicus; and it is at these parts that hernia most frequently occurs. 2. The abdominal parietes may be weak from malformation, or congenital deficiency. 3. They may be weakened by injury or disease, such as abscesses, wounds, and bruises, or by distension by the pregnant uterus, or by dropsy.

The *exciting* cause is compression of the viscera by the action of the muscles that surround them, and especially of the diaphragm. Hence hernia is so frequent a result of violent bodily exertion—lifting heavy weights and the like—especially if the patient have been previously weakened by illness. Moreover, it is not uncommon in persons afflicted with stone or stricture, from the immoderate straining that they employ in passing their urine.

The viscera most liable to hernial protrusion are the small intestines, omentum, and arch of the colon. But every one of them has occasionally been found protruded, partially or entirely—especially in cases of congenital deficiency of the abdominal parietes.

The Sac of a hernia is a portion of the *parietal* or *reflected* layer of peritonæum which the protruding viscera push before them in their escape, and which forms a pouch containing them. It very soon contracts adhesion to the surrounding cellular tissue, and consequently does not return into the abdomen when the viscera are replaced, although it must be observed, that a hernia may be pushed back *en masse*, sac and all, when great force is used in reducing a strangulated hernia. As the hernia increases in size, the sac also increases; partly by growth, partly by distension, and slight laceration or unravelling; partly by fresh protrusion of peritonæum. Sometimes it diminishes in thickness whilst increasing in capacity; sometimes, on the contrary, it becomes thick, indurated, and divisible into layers. Its *neck* (the narrow part which communicates with the abdomen) always becomes thickened, rigid, and more or less puckered, in consequence of the pressure of the muscular or ligamentous fibres which surround it. Sometimes the sac has two constricted portions, or *necks*—either because (as in oblique inguinal hernia) it passes through two tendinous apertures—(the external and internal abdominal rings)—or because the original neck has been pushed down by a fresh protrusion. Some herniæ, however, are destitute of a sac, or at least of a complete one. This may happen,—1. If the protruded viscus is not naturally covered by peritonæum; as the cæcum. 2. If the hernia occur in consequence of a penetrating wound. 3. In some cases of congenital umbilical hernia. 4. Hernia may be considered virtually without a sac, if the sac has been burst by a blow, or if it has become entirely adherent to its contents. Instances, again, are known in which two peritoneal sacs have protruded through one and the same aperture in the abdominal parietes; and in which one sac has come down within a previously-existing one.

Division.—Hernia is divided into several species: 1st, according to its *situation*—as the inguinal, femoral, and so forth; 2ndly, according to the *condition of the protruded viscera;* which may be (*a*) *reducible*, or returnable into the abdomen; (*b*) *irreducible*, that is, not returnable into the abdomen; or (*c*) *strangulated*, that is, subject to some constriction, which not only prevents their return into the abdomen, but also interferes with the passage of their contents, and with their circulation.

SECTION II.—REDUCIBLE HERNIA.

Symptoms.—A soft compressible swelling appears at some part of the abdominal parietes. It increases in size when the patient stands up; if grasped, it is found to dilate when he coughs or makes any exertion; and it diminishes or disappears when he lies down, or when properly-directed pressure is made upon it. If the sac contains intestine (*entero-cele*), the tumour is smooth, rounded, and elastic; *borborygmi* (or flatulent croakings) are occasionally heard in it, and when pressed upon, the bowel returns into the abdomen with a sudden jerk and gurgling noise. If, however, it contains omentum (*epiplo-cele*), the tumour is flattened, inelastic, flabby, and unequal to the touch, and when pressed, it returns without noise, and very slowly, the pressure requiring to be continued till it has nearly disappeared. But very often one hernial sac contains both intestine and omentum (*entero-epiplo-cele*);* and very frequently it is perfectly impossible to ascertain which it contains by any external examination.

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* From κήλη, *tumour;* ἔντερον, *intestinum;* and ἐπίπλοον, *omentum.* The word κήλη is frequently used in the older surgical terminology; ex. gr., *hydrocele*, a tumour containing water; *hæmatocele*, a tumour containing blood; *bubonocele*, a hernial tumour in the groin.

Treatment.—This may be palliative or radical. The usual plan is, to employ a *truss*, an instrument consisting of a pad placed on the seat of protrusion, and of a steel spring which passes round the body, and causes the pad to press with the requisite degree of force. In writing for a truss it is usual to give the circumference of the body at the hips, midway between the spine of the ilium and the trochanter. The patient must expect to find the truss rather irksome for the first week. It should be constantly worn by day; and if the patient will submit to wear it at night, also, so much the better. If he will not do this, he should, at all events, apply it in the morning, before he rises from the recumbent posture. The skin of the part which it presses upon should be regularly washed, and bathed with Eau de Cologne or spirit, else large boils are apt to form on it.

There are some cases in which the common truss fails to keep up a rupture comfortably, and for these the surgeon should be prepared to recommend other instruments, which are, for the most part, the property of various individuals, and each of which has some peculiarity adapting it to particular cases. *Coles's truss* has a spiral spring acting on the pad. The *MocMain lever truss* has a simple belt passing round the body, thus dispensing with the usual circular spring; and the pressure on the pad is effected by means of a strap passing under the thigh, and acting on a spring lever attached to the pad. *Salmon and Ody's* self-adjusting truss has a pad revolving on a ball and socket. The *Maidstone truss* allows the pad to slide on the spring, so that the circumference of the instrument may be adapted to the varying size or movements of the body. *Egg's truss* is said to be made of old sword-blades: it is very strong, though not irksome, and requires no fastening. *Adams's graduated pressure truss* has two springs of different curves, by sliding which on one another the amount of pressure may be varied. In *Tod's truss* the spring goes round the waist, and curves downwards to compress a pad at the internal abdominal ring. *Newson's* wire truss has a round wire, instead of a flat steel spring, which renders it less likely to be displaced. Trusses may have *French pads*, which are of an oblong-triangular shape, instead of oval, like the English; or pads filled with air; or with sand, which will retain any shape given to it; or may have springs going entirely round the body. Instead of a steel spring an elastic India-rubber belt may be used, such as are constructed by Bourjeaud. Dr. Arnott has devised a truss, in which, by means of a wire, external to the steel spring, and capable of being tightened or slackened by a nut and screw, the amount of pressure can be regulated with the greatest possible nicety. Dr. Charles Edwards has invented one, in which the pad is capable both of revolving and of sliding on the spring. For children the *India-rubber* band and pad generally answer without a spring. A pad of hard polished wood is recommended by Mr. Dartnell. He also uses flannel instead of leather as a covering for the spring, as it can be washed.*

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* It is made by Spratt, of Brook-street, Hanover-square. Dr. Charles Edwards's (of Cheltenham) is made by Weiss. Dartnell, Lancet, 1848, vol. ii.

Radical cure.—If the patient is below the age of puberty, or not much above it, and if the hernia has not existed very long, the truss, if constantly worn, may effect a permanent cure. The herniary aperture, no longer subject to distension, then becomes firmly closed, and the neck of the sac obliterated. This cure may perhaps occur in two or three years; but, as a measure of precaution, the truss should be worn for two or three years more. This is constantly the case with the umbilical and other herniæ of infants.

But the herniæ of *adults* have commonly till of late in this country been considered as admitting of palliative treatment by truss only; and the patient has been doomed to wear the instrument for the rest of his days.

Modern surgery promises, however, that some means of radical cure shall be placed at our disposal, which we shall describe more conveniently under the head of reducible inguinal hernia.

SECTION III.—IRREDUCIBLE HERNIA.

Definition.—Hernia is said to be *irreducible*, simply, when the protruded viscera cannot be returned into the abdomen; although there is no impediment to the passage of their contents, or to their circulation.

Causes.—Hernia may be rendered irreducible, 1, by an adhesion of the sac to its contents, or of the latter to each other, or by membranous bands formed across the sac. 2. By enlargement of the omentum or mesentery—whether from simple deposition of fat, or from sarcomatous or other organic change. 3. Omental hernia may be rendered irreducible by a contraction of that portion which lies in the neck of the sac, so that it is not stiff enough to stand against the pressure intended to push it back into the abdomen, but doubles up under it.

Consequences.—Irreducible hernia may produce sundry inconveniences. In the first place, the patient is often liable to dragging pains in the abdomen, or perhaps attacks of vomiting, which come on after food, or when he assumes the erect posture, because the protruded omentum or intestines being fixed, resist all distension or upward movement of the stomach. These inconveniences will be greatly aggravated, if the patient increase in corpulency, or become pregnant. Moreover, the protruded bowels being deprived of the support naturally afforded them by the abdominal muscles, their fæculent contents are apt to lodge in them, and frequently cause colic or constipation. Lastly, the bowel is greatly exposed to external injury, and in constant hazard of strangulation.

Treatment.—This may be either palliative or radical. 1. The *palliative* treatment consists in applying a hollow bag truss, or else a truss with a hollow pad that shall firmly embrace the hernia, and prevent any additional protrusion. The patient should avoid all violent exertion or excess in diet, and should never let his bowels be confined.

2. *Radical Cure.*—It has occasionally happened, after confinement to bed for several weeks with fever or some other emaciating ailment,

that a hernia, irreducible before, has been replaced with ease, owing to an absorption of the fat of the omentum or mesentery, and relaxation of the abdominal apertures. The same result has also in some cases been effected by art—by keeping the patient in the recumbent posture and on very low diet for six weeks or two months, and by the frequent use of glysters and laxatives, and at the same time by keeping up a constant equable pressure on the tumour by means of a bag truss made to lace over it. This plan is very uncertain as to its results, and will be effectually defeated if there are any adhesions; and, besides, there are not many patients who will submit to it. It will be more likely to succeed if the hernia is omental, than if it contains intestine. But several instances are known, in which, after the contents of old herniæ had been replaced, they produced so much irritation in the abdomen, that the patients were glad to compound for their life by keeping the hernia. Any surgical operation with the view of opening the sac, dividing adhesions, and returning the parts into the abdomen, is scarcely justifiable, as it would be exposing life to too great a hazard.*

SECTION IV.—STRANGULATED HERNIA.

Definition.—Hernia is said to be strangulated, when it is constricted in such a way, that the contents of the protruded bowel cannot be propelled onwards, and the return of its venous blood is impeded.

The *causes* of strangulation may be, 1. A sudden protrusion of bowel or omentum through a narrow aperture, in consequence of violent exertion;—a thing not unlikely to happen if a truss has been worn for some time, and then is carelessly left off. 2. Distension of the protruded intestines by flatus or fæces, or tumefaction and congestion of the omentum or mesentery. 3. Swelling of the neck of the sac may be a cause; and *spasm* was formerly considered so.

The *seat of stricture* is either the thickened portion of peritonæum which forms the neck of the sac, or tendinous bands external to it. In some cases the bowel has been constricted by membranous bands, or by fissures in the omentum within the sac itself. But it must be recollected that the membranous aperture, through which the displaced bowel passes, does not exert any active force upon it;—on the contrary, it is the ruptured part which has been squeezed into a narrow aperture, and is pressing outwardly against that aperture. Yet the effect is the same in either case.

The *symptoms* of strangulated hernia are, *first*, those of obstruction of the bowels; *secondly*, those of inflammation. The patient first complains of flatulence, colicky pains, a sense of tightness across the belly, desire to go to stool, and inability to evacuate. It is true that stools may be passed if there be any fæcal matter in the bowel below the hernia, or if the hernia be entirely omental, but with very transient relief. To these symptoms succeed vomiting of the contents of the stomach, then of mucus and bile, and, lastly, of matters which have acquired a *stercoraceous* appearance by being delayed in the small intestines. On examination the surgeon finds a rupture, which he cannot put back, and which is uneasy, tense, and incompressible. The communication between the abdomen and the misplaced bowel is almost, or, if the stricture be tight, is quite interrupted; and therefore the impulse felt on coughing is either diminished or altogether lost. Moreover, as Mr. Luke* very clearly pointed out, if the hernial tumour is examined with both hands, and if one hand is employed in grasping the body of the tumour, and two fingers of the other in feeling near the neck of the tumour for the impulse created by each act of compression, it will be found that the sensation of impulse will cease to be felt at the part where the stricture exists; and will not be felt all along the neck of the hernia, as it would if no stricture existed. If this state of things continue, the inflammatory stage comes on. The neck of the sac becomes tender, and tenderness diffuses itself over the tumour and over the abdomen, both of which become very painful and much more swelled. The countenance is anxious; the vomiting constant; the patient restless and despondent; and the pulse small, hard, and wiry. After a variable time, the constricted parts begin to mortify. The skin becomes cold, the pulse very rapid and tremulous, and the tumour dusky red and emphysematous; but the pain ceases, and the patient, having perhaps expressed himself altogether relieved, soon afterwards dies.

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* See B. Cooper, quoted in Ranking, vol. xvi. A case in which Velpeau practised subcutaneous incisions for the relief of an irreducible hernia is related in Bull. Gen. de Thérap., 15th and 30th Aug. 1840.

Varieties.—There is often considerable diversity in the rapidity and violence of these symptoms. If the patient is a strong adult, and the strangulation has commenced suddenly with a fresh protrusion during some forcible exertion, the inflammatory stage may come on instantly, and be followed by death in a very few hours. On the other hand, if the patient is old, if the hernia has been long irreducible, and has a large neck, and if the strangulation is produced by distension of the protruded bowel with flatus or fæces—the symptoms of mere obstruction may last many days before those of inflammation come on. To this latter class of cases the term *incarcerated* is applicable.† Again, if the hernia be omental, the symptoms will probably be less acute than if it be intestinal; but not much less. Even if a portion of the calibre of the bowel is constricted, and not the whole—so that a passage may be left—the symptoms will be the same.

Morbid Appearances.—After death from strangulated hernia, the bowels are found reddened, the upper portion of them much distended, and there are effusions of turbid serum and lymph. Around the sac the tissues are œdematous or emphysematous. The strangulated intestine is dark, claret-coloured, and turgid with blood, roughened in patches by a coating of lymph;—or displaying patches of gangrene, in the form of greenish or ash-coloured spots, which break down under the finger. The mucous and muscular coats, where they have been subjected to the pressure of the stricture, are liable to be ulcerated. The omentum is dark red; if gangrenous, it feels crispy and emphysematous, and the blood in its veins is coagulated. The sac also contains bloody serum.

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* Quoted in Mr. Ward's very able Memoir on Strangulated Hernia, Lond., 1854. See also Med. Times, Dec. 1854.

† There is great confusion in the use of these terms, as some surgeons employ the term *incarcerated* to signify what is generally known as *irreducible* hernia.

Treatment.—The indications are, to return the intestine, or such portion of it as may be reducible; and for this purpose to divide any constricting part, if necessary.

The Taxis.—This is a Greek word, absurdly and pedantically used to signify the acts of gentle pressure with the hands, by which herniæ are reduced. The bladder having been emptied, the patient should lie down in an attitude of complete repose, and be put under the influence of chloroform; if this be not used, he may be made to lie in a warm bath, with his shoulders raised; and both his thighs should be bent towards the belly, and be placed close to each other, so that every muscle and ligament connected with the abdomen may be relaxed. If not narcotized, he should be engaged in conversation, to prevent him from straining with his respiratory muscles. In order effectually to remove the expulsive force of the diaphragm, Dr. Buchanan, of Glasgow, directs the patient to make a deep expiration, and to abstain from drawing in the breath as long as possible.* Then the surgeon, if the tumour be large, grasps it with the palms of both hands, gently compresses it, so as to squeeze out a little flatus and venous blood, and occasionally with his fingers gently moves the parts at the neck of the tumour, or perhaps tries to pull them very gently downwards, in order if possible to dislodge them.† This operation may be continued for a quarter or half an hour, or longer, if the tumour is indolent, but not so long if it is tender; and at last, perhaps, the surgeon will be delighted to hear a gurgling sound accompanying the return of a portion of intestine. The operator should recollect that too much force may bruise or rupture the viscera, or drive sac and all into the abdomen, or push them between the layers of abdominal muscles, and that he must not be satisfied with a partial reduction of the volume and tension of the tumour, if the vomiting remains unrelieved; because, as Mr. Mayo has shown, such a diminution might be caused by merely forcing the serum contained in the sac into the abdominal cavity.

If the taxis do not succeed, certain auxiliary measures are commonly resorted to.

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* Quoted from Glasgow Medical Journal, July, 1856, in Ranking, vol. xxiv.

† Mr. T. Hunt, late of Herne Bay, now of Alfred Place, in a communication with which he has favoured the author, condemns all kneading and pushing, and says that he believes that gentle, long-continued, and equable pressure will reduce every hernia, provided time and gentleness are allowed for the operation. Mr. Hunt's opinion is grounded upon numerous cases during a practice of thirty years.

(*a*) The first to be mentioned is *chloroform*, inhaled till it produces complete relaxation and unconsciousness.

(*b*) *Bleeding* to the approach of syncope may be tried if the patient is robust, the hernia small and of recent date, and if there is much tenderness of the sac or of the abdomen, in which latter case it may be employed before trying the taxis.

(*c*) The *hot bath* (96°—100° F.) continued long enough to produce great relaxation is useful in similar cases; but it must be recollected that a delicate person will not be very likely to bear the shock of an operation, if bled or boiled to death's door first of all.

(*d*) A large dose of *opium*, or *morphia*, is a remedy most useful in cases of acute strangulation, if for any reason chloroform be not given; and especially if the pain and vomiting are violent.

(*e*) The *tobacco enema* (ʒj and Oj aq. ferv. allowed to stand ten minutes, and half to be used at a time) has certainly been successful in many cases, especially of inguinal hernia; but it is a most dangerous remedy. It has proved immediately fatal to some patients, and has rendered others incapable of surviving the shock of the operation.

(*f*) *Cold* applied to the tumour by means of pounded ice or a freezing mixture (F. 114) in a bladder, is a remedy commonly enumerated; and is said to be most applicable to large scrotal herniæ when the symptoms are not very urgent. But it is not without its hazards; for it may cause gangrene of the skin if applied too long, or if hot applications are incautiously used after it; and above all, it may be the excuse for injurious delay. Certainly it should not be used if painful.

(*g*) *Purgatives and enemata* are irritating and mischievous in sudden acute strangulation, but vastly beneficial if the patient is aged, the hernia large and long irreducible, and if the attack has been preceded and caused by constipation. Large doses of calomel and colocynth are the best purgatives, and the enemata should consist of as much gruel or water as can be injected without causing very much pain or distension. Moreover, Dr. O'Beirne has fully shown that greater benefit is to be derived in cases of incarcerated hernia and obstinate constipation from passing up a long tube (the tube of a stomach-pump answers very well) into the colon, than from the use of the ordinary short enema-pipe. The long tube relieves the bowels of their flatus; and of course by diminishing the bulk of the contents of the abdomen, renders the return of the hernia more easy.*

Operation not to be delayed.—In old standing cases, occurring to aged people with large herniæ, the surgeon may be justified in waiting some time to try the effect of his remedies; but in acute cases occurring to young people, we would earnestly inculcate the rule that if the taxis, aided by chloroform or opium, do not very speedily succeed, it is the safest plan to perform an operation for dividing the stricture without further delay. It is very well remarked by James of Exeter,* that *time* is of the most extreme value in the treatment of strangulated hernia. The earlier the taxis is tried, the more likely it is to succeed; before the bowel has been long and strongly nipped, and thickened by congestion. The same may be said of an operation.

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* Vide Lancet, July 6 and 27, 1839; also James's Retrospective Address, in Prov. Med. Trans., 1840; and O'Beirne on Defæcation.

The *operation* that may be performed may be either the old one of opening the sac, dividing the stricture, and returning the intestine; or *secondly*, the plan of division of the stricture, without opening the sac; or *thirdly*, Mr. Gay's operation for limiting the incisions to the neck of the sac. The manner of operating for each variety of hernia will be found in the following sections. Here we make a few observations applicable to the subject generally.

1. *Supposing the sac to be opened*, the intestine should be well examined, and especially that part of it which has been actually compressed by the stricture, and which should be gently drawn down for that purpose. If it be merely dark claret-coloured from congestion, or slightly roughened with lymph, or if it exhibit a few black patches of ecchymosis, it should be returned—the operator being careful to replace it bit by bit—intestine before omentum—and those parts first which protruded last. The wound may then be closed with sutures, and a firm compress be placed upon it.

2. If the hernia were irreducible long before it was strangulated, and if its contents are united to the sac by firm and broad adhesions, they should not be disturbed. But if the adhesions are recent, or very thin and slight, they may be divided and the bowel be returned.

3. If the intestine is mortified, which will be known by the softened green or ashy spots, the mortified parts should be slit open, the stricture be divided, and the patient left to recover with an artificial anus. Again, if a large portion of intestine, which has been long irreducible in an elderly person, appear extremely dark and advanced towards sphacelus, so as to render it doubtful whether it would be capable of performing its functions when returned, it has been advised to make an opening into it, and so afford an outlet for its contents through an artificial anus; but such a proceeding must not be rashly resorted to.

4. If the omentum is gangrenous, or if it is thickened and indurated, it would, if returned, excite dangerous irritation of the peritonæum. In this case some surgeons advise it to be left to granulate in the sac, or to cut it off close to the neck of the sac, and leave it there as a plug to prevent further protrusion. Macfarlane and others, on the contrary, recommend it to be cut cleanly off, and all the vessels to be tied with fine silk ligatures, and the end to be then passed quite into the abdomen, breaking up any adhesions about the neck of the sac, if necessary; thus avoiding the dragging pains and colic which are liable to occur if a portion of the omentum or intestine is fixed.

5. But it may happen that there may be a portion of intestine con-

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* On the Operations for Strangulated Hernia. Lond., 1859.

cealed within the omentum, and completely enveloped in a kind of sac formed by it. This is especially liable to be the case in the umbilical hernia. Therefore, to use the words of Mr. Prescott Hewett, "when the hernial sac appears to contain thickened omentum only, the omentum ought to be drawn out and carefully examined, to see that it does not form a sac containing a portion of intestine."[*] If it is thickened and firmly united to the neck of the hernial sac, throughout its whole circumference, an incision should be carefully made through it; bearing in mind that it is often extremely thick, and that the intestine may be firmly adherent to its inner surface. In fact, as Mr. Hewett says, the surgeon ought *carefully* to "examine every portion of omentum which is in a hernial sac, so as to ascertain that no knuckle of intestine is contained within its folds, before it is returned into the abdomen, left in the sac, or removed altogether."

Division of the Stricture external to the Sac.—Petit, Aston Key, Luke, and other eminent surgeons have recommended that the stricture should be released without opening the sac itself. The argument in favour of this proceeding is, that less injury is inflicted; that there is no rough handling and exposure of the intestine; and that the case is brought nearer, as regards safety, on a level with one in which no operation has been performed. The argument is confirmed by experience; and this mode of operating should always be adopted, unless there is some reason to the contrary. It is especially advisable, when the hernia is of very great size, and has been long irreducible, so that the idea of returning its contents could not be entertained; and when the hernia is small and of quite recent date. In a similar case, M. Guérin has divided the stricture by means of a subcutaneous incision.[†]

Mr. Gay's modification of this operation consists in making a small incision, near the neck of the sac, and carrying the tip of the forefinger to feel for the seat of stricture, and dividing it by a *bistouri caché*. We shall allude to this operation again when speaking of femoral hernia, to which it is chiefly applicable; and may remark that the advantages claimed for it are, that it meddles only with healthy parts, is slight, comparatively safe, and easily performed, and that there is no long convalescence.

Seutin's Plan.—Baron Seutin has described a method of dilating the stricture, which he has employed so successfully that he rarely has had occasion to use the knife for strangulated hernia. It consists in insinuating the tip of the forefinger into the constricting orifice, and dilating it forcibly. There is a germ of good sense and reason in this which makes it well worthy of trial.[‡]

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[*] Med. Chir. Trans., vol. xxvii.

[†] Vide Fergusson's Practical Surgery, p. 526. Guérin, Gaz. Méd. de Paris, 7th Aug. 1841; Mr. Key's Memoir, on dividing the stricture external to the sac; Luke, Med. Chir. Trans., vol. xxxi.

[‡] The surgeon seeks with his forefinger for the aperture that has given issue to the hernia, pushing up the skin sufficiently from below: then with the pulp of the finger towards the bowel or omentum, he insinuates it between the viscus and the aperture. This proceeding demands perseverance. When intro-

Hernia reduced en masse.—When the taxis is used forcibly for the reduction of a strangulated hernia, the tumour, sac and all, may be forced back through the herniary aperture, and lie between the abdominal muscles and the peritonæum; or between the muscles and the fascia transversalis. Or, according to Mr. Birkett, the neck of the sac may be burst, "so that the intestine escapes into the loose connective tissue between the peritonæum and internal abdominal fascia." In such a case, the symptoms of strangulation continue, and although the tumour disappears outwardly, yet there will be symptoms of fulness and tenderness above Poupart's ligament, in the situation of the internal ring. The first thing to be done is to make the patient stand up and cough, in order if possible to bring the hernia down again, when it should be operated on without delay; but if this does not succeed, a cautious incision should be made through the abdominal parietes, over the suspected seat of the disease; the tendon of the external oblique should be divided, so as to lay open the internal abdominal ring; and the sac if found should be drawn down, the stricture divided, and the case be then treated according to the ordinary rules.[*]

After-treatment.—After the hernia has been returned, a compress—a towel, for instance,—should be put on the site of the tumour, and be retained with a bandage, so as to prevent any protrusion from coughing, sneezing, or any other accidental exertion, and the patient should have a full opiate. The surgeon should not be in haste to get the bowels to act, and should abstain from giving salts and other purgatives; for as the intestine that was constricted remains for some time inflamed, weakened, and incapable of propelling its contents, they would but irritate it uselessly. Castor-oil and laudanum may be resorted to after twelve or twenty-four hours. Tenderness, pain, and other inflammatory symptoms may be allayed by leeching, fomentations, and by calomel and opium. Free exit should be afforded to pus. A truss should be applied before the patient gets up again.

SECTION V.—REMARKS UPON THE DIAGNOSIS AND COMPLICATIONS OF HERNIA.

We may remark that hernia is a malady extremely common in every rank of life, and one for which the practitioner should never fail to make inquiry, in cases of disturbance of the abdominal viscera.

1. *The patient may not be aware that he has a hernia,* or if aware of it, may think it of no consequence, or may be deterred by *mauvaise honte* from mentioning it. For example, an elderly clergyman of

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duced, the finger is to be hooked, and made to stretch the ring till a sensible dilatation or tearing is produced. The plan appears to have been most successful in femoral hernia; and when stricture was seated at the external abdominal ring. Quoted in Ranking, vol. xxiv., p. 164.

[*] Luke, Med. Chir. Trans., and Med. Gaz., 5th May, 1843; Report of discussion on a paper by Mr. Birkett, at Med. Chir. Soc., Med. Times, June 25, 1859.

eminence consulted the writer a few years since, respecting various dyspeptic symptoms; nausea, loss of appetite, and painful sensation of dragging at the stomach, and irregularity of the bowels. When asked if he was ruptured, he said, that he had never thought it worth mentioning, but that whilst preaching, some time ago, he had felt something come down into the scrotum. He had in reality a large double scrotal rupture, which was the cause of his dyspepsia.

But it is more particularly when a patient is affected with vomiting and constipation, especially if the face is pinched and anxious, that the surgeon should inquire for, or rather should examine for himself, the *ordinary* seats of hernia, such as the inguinal and femoral rings and the umbilicus, and the *extraordinary*, such as the linea alba, and the thyroid and ischiatic foramina. It would be a terrible thing to be treating a patient for enteritis, and let him die of strangulated intestine.

2. *The patient may have a tumour*, at one of the common seats of hernia, *which yet is no hernia.* The commonest example of this is an enlarged gland at the bend of the thigh. Yet if, with such a tumour, a patient should have symptoms of strangulation, the surgeon should not hesitate to cut down upon it. There often has been found a small hernia behind such a tumour; and in any such case the rule is, *if in doubt, operate.*

3. *The patient may have a hernia*, reducible, or irreducible, which yet is *not the cause of the symptoms.* There are numberless causes of internal strangulation, which may exist along with a hernia. *First*, the bowel may be strangulated within itself; a condition known as intussusception, and described at page 507. *Secondly*, it may be strangulated by an awkward twist on its own axis. *Thirdly*, it may be tied down by some accidental band, the result of previous inflammation; a thing that should always be inquired for. In women, bands of adhesion not seldom exist between one ovary and some adjoining part: and this should be borne in mind. *Fourthly*, the bowels may be simply matted together by recent adhesions, the result of subacute inflammation. *Fifthly*, they may be thrust through an aperture in the diaphragm. (See *Diaphragmatic hernia.*) So that in any case, if the condition of a hernia does not account for the symptoms of strangulation, the possibility of some other cause should be looked for. The following cases may be examples. The author was sent for to see a stout elderly man, whom he found in bed, with vomiting, and intense pain of eight hours' duration. On inquiry, it was discovered that he had an umbilical hernia; but this was reduced and not tender, although there was great tenderness and fulness in the vicinity. The bowels had been open the day before. Two grains of opium were administered. At the next visit, the writer was shown a large quantity of bloody serous fluid which had passed from the bowels. Another dose of opium was given, and the patient kept under its influence. Late at night some bilious matter passed, and the patient gradually recovered. These were symptoms of intussusception.

Whilst the author is correcting these pages, he is sent for to see a patient æt. 57, ill for a week, with pain in the bowels and vomiting. The man's countenance exhibits severe suffering; he is constantly vomiting a white frothy liquid, and says he has burning pain in his stomach. Has had double-scrotal rupture from infancy. On examination both ruptures were thoroughly reduced; and the forefinger, pushing the flabby scrotum before it, could be passed up through tendinous apertures an inch in diameter, into the abdomen. Everything was soft in the neighbourhood. But in the left iliac fossa was a large swelling, somewhat nodulated. There was great tenderness in the right hypochondrium. Repeated enemata brought away enormous quantities of small *pale brown* lumps, and the swelling in the sigmoid flexure disappeared; but it took two days to bring down dark-green bile from above.

If a patient with *irreducible* hernia be attacked by colic, or enteritis, or peritonitis, the case will present many of the features of strangulation. Yet it may perhaps be distinguished by noticing that the pain and tenderness did not begin at the neck of the sac, and are not more intense there than elsewhere. The diagnosis will be very obscure if the inflammation commences on the omentum or intestine in the sac. But the general rule is, *when in doubt, operate.*

4. "Strangulation may occur in a person the subject of *double hernia*, and a doubt may arise as to which is the hernia requiring operation. In such a case, the hernia that has existed the longest, and is the most tense, should be the one first subjected to the knife."*

5. *Reduction en masse.*—Lastly, the possibility of this accident should be remembered. (See page 522.)

SECTION VI.—INGUINAL HERNIA.

Definition.—Inguinal hernia is that which protrudes through one or both abdominal rings.

Varieties.—There are four varieties. The oblique, direct, congenital, and encysted.

1. The *oblique* inguinal hernia is the most common. It takes precisely the same route as the testicle takes in its passage from the abdomen into the scrotum. It commences as a fulness or swelling at the situation of the internal abdominal ring, that is to say, a little above the centre of Poupart's ligament, next passes into the inguinal canal (and in this stage is called *bubonocele*), and if the protrusion increase, it projects through the external ring, and descends into the scrotum of the male, or labium of the female. The *coverings* of this hernia are, 1, Skin. 2, A strong layer of condensed cellular tissue derived from the *superficial fascia* of the abdomen, in which the *external epigastric artery* ramifies. With this is mostly incorporated, 3, the *fascia spermatica*, a tendinous layer, derived from the intercolumnar bands, a set of semicircular fibres, which connect the two

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* R. R. Robinson, on Complication of Hernia, Lond. Jour. Med., 1851.

margins of the external ring. Under this lies, 4, the *cremaster muscle*, sometimes called *tunica communis*. 5. Next comes the *fascia propria*, a cellular layer continuous with the *fascia transversalis* of the abdomen; and lastly, 6, the sac. The *internal epigastric artery* is always internal to the neck of the sac. The *spermatic cord* is generally behind the sac; but, in old cases, the parts which compose the spermatic cord are separated by the tumour, so that the vas deferens and spermatic artery lie sometimes in front, sometimes on either side of it.

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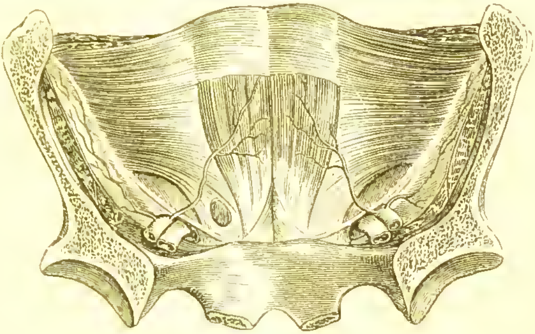

2. The *direct* inguinal hernia bursts through the *conjoined tendon* of the internal oblique and transversalis muscles, just behind the external ring. Its coverings are the same as those of the oblique variety, except the cremaster, for it has no connection with the cord. The epigastric artery runs external to the neck of the sac. This hernia may, however, push the conjoined tendons before it, instead of bursting through it. The spermatic cord generally lies on its outer side.

3. The *congenital* hernia is a variety of the oblique, and is so called because the state of parts which permits of it only exists at or soon after birth. A portion of omentum or intestine accompanies the testicle in its descent, and passes down with it into the very pouch of peritonæum which forms the *tunica vaginalis reflexa*, before its communication with the general peritonæal cavity has become obliterated. The sac of this hernia is consequently formed by the tunica vaginalis; its coverings in other respects are the same as those of the oblique variety, and the protruded bowel lies in immediate contact with the testicle, and if not replaced generally adheres to it.

4. The *encysted* (or *hernia infantilis*) is a sub-variety of the congenital. The protruding bowel pushes before it a sac of peritonæum either into or close behind the tunica vaginalis, and this tunic and the

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* This diagram, copied from Tiedemann, gives an internal view of the parts concerned in the formation of hernia; and on the left side shows the usual place at which direct inguinal hernia protrudes.

sac adhere very closely together. This hernia, therefore, has, as it were, two sacs: viz. one proper sac, and another anterior, composed of the tunica vaginalis, which in these cases is very liable to be the seat of hydrocele. The second figure shows another variety of the encysted hernia, in which the sac is apparently formed of tunica vaginalis, but its communication with the testicle is closed.

Fig. 1.*

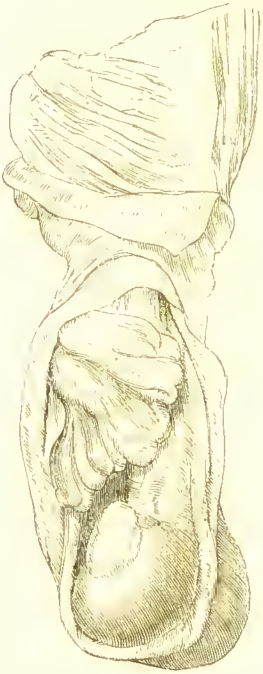
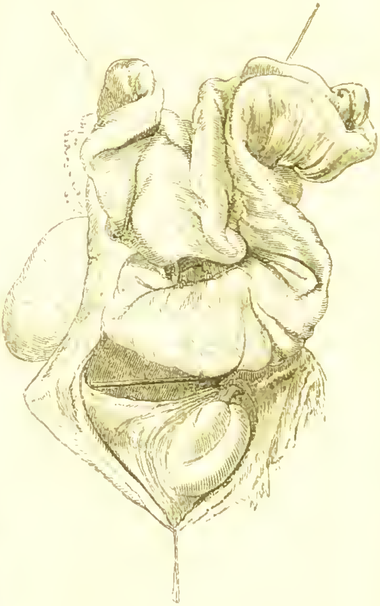


Fig. 2.



Diagnosis.—1. The difference between the *oblique and direct inguinal herniæ*, and their relations to the epigastric artery, are shown in the figure on page 527, which is taken from Tiedemann. In the oblique, the neck of the tumour inclines upwards and outwards, and causes a fulness extending up to the middle of Poupart's ligament. In

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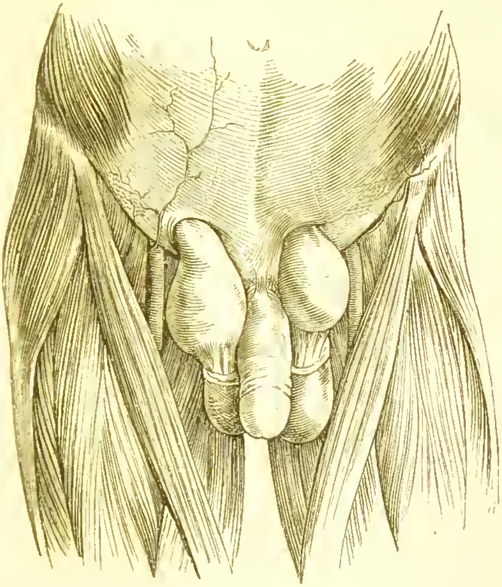
[*] From the King's College Museum. Fig. 1 exhibits a congenital omental hernia of the right side. Fig. 2, an encysted hernia; a kind which was first described by Hey, of Leeds, in a letter to Gooch. (Vide Gooch's Chir. Works, vol. ii., p. 217.) He says: "The intestine in this case had forced its way into the scrotum before the tunica vaginalis had formed its adhesion to the cord, but after its abdominal orifice was closed: under which circumstance it brought the peritonæum down with it, forming the hernial sac: contrary to what happens in the hernia congenita, where the intestine descends before the orifice in the tunica vaginalis has closed, and consequently has no hernial sac but that tunic."

the direct it inclines (if at all) rather inwards; and when the hernia is reduced, the finger, carrying integument before it, can be passed straight back into the abdominal cavity. But in old cases of oblique hernia, the neck of the sac is dragged down towards the middle line, so that all distinction is lost.



2. *Hydrocele* may be distinguished from hernia by its beginning at the bottom of the scrotum; by its being semi-transparent and fluctuating, and preventing the testicle from being clearly felt (whilst the cord can be distinctly felt above it); and by not dilating on coughing. Whereas hernia begins at the top of the scrotum; it is not transparent; does not fluctuate; does not prevent the testicle from being clearly felt, although it obscures the cord; and dilates on coughing. But hernia may and does often coexist with hydrocele, the former beginning from above, the latter from below. Moreover, a hernia, consisting of intestine greatly distended with flatus, has been known to be as transparent as a hydrocele.

3. *Hydrocele of the Cord*, if low down, may be distinguished by its transparency and fluctuation; but if high up, it may extend into the abdominal ring, and receive an impulse on coughing, and the diagnosis be very difficult. But as a hernia may be concealed behind this kind of tumour, the rule, *when in doubt, operate*, should be acted upon in case of symptoms of strangulation.

4. *Varicocele* (or *cirsocele*), which signifies a varicose enlargement of the spermatic veins, resembles hernia, inasmuch as it increases in the erect posture, and perhaps dilates on coughing; but it may be distinguished from hernia by its feeling like a bundle of tightly-distended veins; and although, like hernia, it disappears when the patient lies down, and the scrotum is raised, still it quickly appears again, if pressure be made upon the external ring, though that pressure would effectually prevent a hernia from coming down again.

5. Lastly, a testicle that has not come down through the external abdominal ring into the scrotum, has been frequently confounded with a *bubonocele*, or small hernia in the inguinal canal; and has been compressed with a truss, to the great pain and detriment of the patient. A little care and attention will prevent this mistake.

Treatment.—1. Inguinal hernia, if *reducible*, must be kept up with a truss. Care must be taken not to let the pad bear against the spinous process of the pubes, or the spermatic cord.

Radical Cure.—From the earliest times attempts have been made to produce a radical cure of this kind of hernia, especially by measures calculated to obliterate the sac. Thus excision of the sac, and of the testicle with it;—ligature of the sac;—pressure by hard trusses; injection of iodine; the use of caustics, so as to produce a slough and subsequent firm cicatrix; the introduction of isinglass, blood, and goldbeaters' skin, have been practised with much danger and little success. At present there are operations, of established repute, which act by plugging up and closing the herniary apertures.

Gerdy's Operation.—More than twenty years since, M. Gerdy proposed a method of pushing a fold of integument up as far as possible into the neck of the sac, securing it in this inverted or invaginated position by means of two sutures (both ends of a ligature being passed from within the invaginated skin), and then denuding the pouch of invaginated skin of its cuticle by means of liquor ammoniæ, so that the surfaces of skin and peritonæum thus opposed to each other respectively may adhere, and the neck of the sac be effectually plugged. This operation was practised by Mr. Bransby Cooper with some benefit. For the herniary aperture in Mr. Cooper's patient was so large before the operation that the bowel could not be kept up by a truss; whereas, after the operation, a common truss enabled the patient to pursue a laborious occupation with safety and comfort.*

Wützer's Operation.—But Gerdy's operation is not always safe, nor always effectual, and is very much inferior to that which Professor Wützer of Bonn has performed since 1838, and which was introduced into England by Mr. Spencer Wells in 1854. The essential parts of it consist in the invagination of a portion of the coverings of the hernia—including skin of the scrotum, fascia, and sac—which are introduced into the inguinal canal; in the use of a wooden plug which shall retain the invaginated tissues there, and which shall be of such a size as to fill the canal as nearly as possible; and in the use of an outward wooden pad, of corresponding size and shape to the plug, which shall be so applied, that by means of equable pressure the opposed surfaces of the invaginated portion of sac shall adhere, so that the neck of the sac shall be plugged up, and obliterated.

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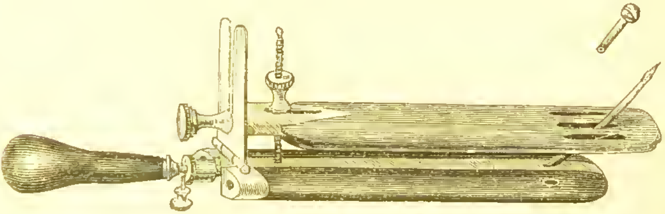
* Bransby Cooper, Guy's Hosp. Rep., Oct. 1840.

The original instrument of Wützer consisted of a roundish plug, with cover to match. The subjoined drawing represents an instrument enlarged and improved by Professor Rothmund of Munich, and subsequently by Mr. Spencer Wells. Mr. Redfern Davies has since suggested that the plug should be made to expand like a glove-stretcher, so that it may fill out the internal ring. The structure and application of it will be readily learned from the following description of the operation.*



The patient's bowels should have been well cleansed by castor-oil a day or two previously, and the rectum be emptied by enema on the morning of the operation. The bladder should be empty, the hair of the affected side removed, and the hernia carefully reduced. The patient should be in the same position as for the taxis. The surgeon stands on the side on which he operates.

The first step consists in invaginating the sac and its coverings. The surgeon using the left forefinger for the left side "places it," says Mr. Wells, "on the scrotum, about an inch below the external ring, and then pushes a fold of the scrotum before his finger, with a little rotatory movement slowly and steadily into the canal, keeping the palmar surface of the finger turned forwards and a little outwards, until it is well under the tendon of the external oblique, and the plug of scrotum is well pressed up to, or through, the internal ring." He must make sure that his finger is within the inguinal canal, beneath the tendon of the external oblique, and that it has not merely slipped up under the skin, outside the tendon.

The next step is, to introduce the wooden plug; which should have the needle or needles passed within it, so far as may be, without permitting their points to project. The surgeon taking it in his disengaged hand, is directed by Mr. Wells to bend the finger which is in the canal, and slip the plug along its dorsal surface, so as to introduce the plug adroitly, whilst withdrawing the finger. Here, again, the operator must be on his guard, both that the invaginated sac and skin do not come down with the finger, and likewise that the wooden plug be introduced into the inguinal canal, and not merely slipped up under the integument; and following Mr. Wells's authority, must feel that the external oblique tendon lies over, and rolls over it; which fact ought also to be ascertained with regard to the preliminary introduction of the finger.

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* See Spencer Wells, first paper, Med. Chir. Trans., vol. xxvii., 1854; also his Lecture in Med. Times, 1858., vol. i., p. 79; and paper in the Dublin Quar. Journ., Med. Sc., May 1858. Redfern Davies, Med. Times, 6th August, 1859.

The next point is, to push the needle or needles onwards, till their points come through the skin. Then the cover must be adjusted, and fixed by the screws—the needles also be fixed in their places by screws; their steel points removed and knobs put on, and the handle of the instrument be taken off.

Thus it will be evident that two surfaces of sac are pressed together, whilst the inguinal canal is filled with invaginated tissue; and now the object is to get the opposed surfaces of sac to adhere. The means thereto is the pressure which may be produced by the screw. The part should be examined every day, by raising the cover, and the pressure equalised, if need be, by a little cotton wool. The patient must be kept in bed, with his knees and scrotum supported. About the fourth or fifth day, inflammatory redness and swelling are seen around the needle punctures; in another day or two, suppuration follows, and serous fluid begins to ooze from the invaginated skin. Now the instrument may be removed, and it will probably be found, by pulling at the skin of the scrotum, that adhesion has taken place firmly; if not, the instrument may be replaced for two or three days longer. If the pressure is too severe, or unequal, or continued, of course sloughing may occur.

"About six or seven days may be allowed," says Mr. Wells, "from the period the instrument is applied, and from seven to fourteen more, till cicatrization is complete; so that the patient must be prepared for a three weeks' confinement to his room. After this, a light truss with a weak spring, and large, well-stuffed pad must be worn for about three months, during which time the patient must abstain from violent exercise."

Professor Rothmund lays stress on the expediency of smearing the wooden plug with cantharides ointment, to cause the inner surface of the invaginated skin to suppurate and adhere; but this seems not to be absolutely necessary, and the cavity soon disappears, leaving a dimple to mark its place.

This operation has now been performed in a large number of cases in England, with complete success in most, with incomplete success or failure in some, and without mischievous results in any. Even when it has failed of complete success, it has enabled a truss, heretofore useless, to be worn with benefit.

Moreover, it seems that there is no case, unless of extreme age and decrepitude, in which it may not be adopted.

Treatment by metallic stitch.—Yet the invagination of the sac and of its coverings, and the adhesion of them within the herniary aperture, can be produced by simpler methods than the apparatus of Wützer. Thus Mr. Spencer Wells, in August 1858, in a case in which Wützer's operation had been performed, and had been followed by some bulging, and a threatening of a return of the hernia, pushed a fold of scrotum up to the external abdominal ring, and passed a handled needle along his finger, and for an inch behind the external oblique tendon. The needle was made to penetrate the skin, and draw back an iron wire, each end of which was secured by a skein of cotton. After seven days the wire was withdrawn, and it was found that some amount of thickening had been produced: the truss was applied again, and a perfect cure followed.

But to Mr. Redfern Davies, of Birmingham, is due the credit of applying a simple form of operation to the femoral and ventral hernia. For instance, in a case of femoral hernia, after it has been returned, the finger or fingers are made to carry a plug of invaginated skin and sac as far as possible into the femoral ring. Then a curved tube, containing a needle, is carried on the finger well through the ring; the needle is made to pierce the doubled integuments, and to bring through a silver wire suture; one, two, or more such sutures are passed, according to the size of the rupture; the ends are passed through small pieces of vulcanized India-rubber, and are secured by split shot clamped upon them after they have been drawn tight. In about eight days the wires are removed; in eight days more the patient may get up and wear a light truss, till the invaginated plug is firmly secured. The application of this method to ventral hernia will be evident.*

Wood's Operation.—In the last place, we come to the operation devised by Mr. John Wood, of King's College, which the author has seen him execute with the most consummate skill, and the good effects of which he has witnessed in a case in which Wützer's operation had failed. It is performed thus:—An incision about half an inch in length is made through the skin of the scrotum, over the spermatic cord, an inch and a half below the pubic spine. The skin is then separated, by means of a small tenotomy knife, from the subjacent fascia in a circle around this incision, about two inches in diameter. Next, the finger is introduced into the wound and made to pass into the inguinal canal. The finger then searches for the arched border of the internal oblique muscle, and is carried behind it towards the linea alba. Then a curved needle, represented in the cut, with its point protected by a tube, is carried up along the concavity of the finger, and made to perforate the conjoined tendon close to the internal ring, and to perforate the skin;

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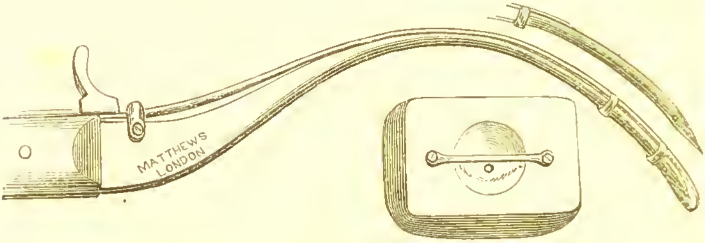
* See Femoral and Ventral Hernia radically cured, by Redfern Davies, Med. Times, Feb. 12, 1859; (four cases of femoral and two of ventral hernia;) Mr. Spencer Wells's case, ib., Feb. 5, 1859.

but the skin, before perforation, is to be drawn upwards and inwards, so that the outward puncture will be, when the skin is restored to its natural situation, lower and more external than the point where the conjoined tendon is perforated. A thread is now put through the eye of the needle, and the needle withdrawn, leaving one *end* of the thread



projecting. The finger next is made to feel for the external pillar of the ring, and to push the cord downwards out of the way; and the needle is carried along it, and made to pierce Poupart's ligament; meanwhile the skin is moved downwards, so that the needle-point comes out at the first puncture. A *loop* of thread is left there and held, whilst the needle is withdrawn. The finger is next made to feel for the internal pillar, and the needle made to pierce the conjoined tendon, the internal pillar, and triangular ligament, half an inch above the pubes. The point is brought out at the same aperture as before, the end of thread is pulled out, and the needle withdrawn. The two separate ends of thread which have perforated the internal pillar, and the loop which has perforated Poupart's ligament, are pulled tight, and are passed through a hole in a boxwood pad, and tied over the bar represented above. Thus the inguinal canal is first filled with invaginated fascia and sac; and then its sides are brought together by this subcutaneous suture, so that it is contracted and made to adhere to the invaginated tissues. A pad and bandage are applied, and the ligatures allowed to remain three or four days. After-treatment as before.

In this operation, the skin is not invaginated; consequently it has no tendency to drag down the other invaginated tissues; on the contrary, it tends to keep them in their place. The time required is shorter; and although some degree of varicocele is apt to follow, yet this cure is more speedy, more certain, and less painful on the whole than Wützer's operation.*

2. The *irreducible* inguinal hernia must be supported with a bag-truss. If it contain only *omentum*, a common truss may perhaps be applied in the usual manner, so as to make the omentum adhere to and plug the neck of the sac. But this cannot often be borne, and is liable to induce swelled testicle.

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* See a description of it, Med. Times and Gaz., June 25, 1859.

3. In attempting the reduction of *strangulated* oblique inguinal hernia, the patient should be placed in the position described in a foregoing page (518), with his thighs as close together as possible (although the surgeon must put one arm between them), and the pressure must be made upwards and outwards.

The *operation* for this hernia is performed thus:—The parts being shaved, and the skin made tense, an incision three or four inches long must be made through the skin, along the axis of the tumour, beginning from above its neck. This will be quite long enough, even for the largest hernia; because the object is to bring the seat of stricture fully into view, without exposing too much of the sac. Then the successive coverings, before enumerated, are usually divided into the following manner:—a little bit of each is pinched up with forceps, and cut into with the knife held horizontally; a director is passed into this little aperture, and the layer is then divided on it to the extent of the incision in the skin. Cautious operators will find (or make) many more layers than those usually enumerated, which are, in fact, easily subdivisible, especially in old herniæ. But the practised surgeon, who knows that he is operating on the living body, and that his object is to cut through everything till he reaches the sac, will dispense with these dissecting-room formalities. When at last the sac is reached, which will be known by its bluish transparency, it is to be opened sufficiently to admit the finger, a little bit of it being first pinched up and cut through, so as to admit the director. Then the left forefinger should be passed up into the neck of the sac to seek for the stricture, which will generally be at the internal ring. It may be at the external ring (or at both); but wherever it may be, it must be dilated so as to allow the finger to pass into the abdomen. A curved blunt-pointed bistoury or hernia-knife—not cutting quite up to the point—should be passed up flat on the finger through the stricture, and its edge be then turned up so as to divide it; and in every case the division should be made *directly upwards*, parallel to the linea alba; and then whether the hernia be direct or oblique, the epigastric artery will not be wounded. If no stricture be discovered in the neck, it must be sought for in the body of the sac.

The subsequent proceedings—the return or otherwise of the intestine, and the after-treatment—are detailed in the preceding section.

If the surgeon performs the operation without opening the sac, the first point, says Mr. Luke, is to ascertain the exact seat of the stricture. Now, since the stricture prevents the communication of impulse from any one part of the tumour to any other part beyond the stricture, all that is required is, to press the tumour firmly between the fingers of one hand so as to cause impulse, whilst with the fingers of the other hand at the neck of the sac, the precise point where impulse ceases is ascertained. At that point will be found the seat of stricture. "The next step is, to incise the integuments so that the centre of the incision shall be directly over the stricture; a proceeding easily accomplished by causing a transverse fold to be pinched up between the fingers and divided by transfixing it with a straight bistoury, in a direction parallel with the long axis of the tumour. The various fascias are subsequently divided, until the neck of the tumour is fairly exposed. If this be carefully and completely done, a depression will usually be observed at the seat of stricture, presenting a more contracted appearance at that part than at others. To the touch this contracted part feels thick, while into it thin layers of fascia dip, which may be mistaken for the stricture itself, but which may be divided wholly independent of it, and no relief arise from the division. When these layers are turned back, the real stricture is exposed to view." Then the next step is, to scarify the thickened peritonæum forming the stricture, so as to render it dilatable, without actually cutting through it, and then the taxis is to be used for the return of the hernia. When the stricture is caused by the margin of the external ring, it is easily divided by the hernia-director and bistoury; when at the internal ring, it must be done by the same means, although the operation is more difficult.*

SECTION VII.—FEMORAL OR CRURAL HERNIA.

DEFINITION.—Femoral hernia is that which escapes behind Poupart's ligament.

It passes first through the *crural ring*—an aperture bounded internally by *Gimbernat's ligament*—externally by the femoral vein—before, by Poupart's ligament—and behind by the bone. It next descends behind the *falciform process* of the fascia lata; thirdly, it comes forward through the *saphenic opening* of that fascia; and lastly, as its size increases, it does not descend down on the thigh, but turns up over the falciform process, and lies on the anterior surface of Poupart's ligament. The *coverings* of this hernia are—1. Skin. 2. The *superficial fascia* of the thigh, loaded with fat, and divisible into an uncertain number of layers. 3. *Fascia propria*, a layer of cellular tissue derived from the sheath of the femoral vessels, or, according to others, from the *fascia cribriformis* which closes the saphenic aperture. It is in general pretty dense about the neck of the hernia, but thin, or even deficient on its fundus. 4. The sac. Between the last two there is often found a considerable layer of fat, which might be mistaken for omentum.

Femoral hernia rarely attains a very large size. It is much more frequent in the female than in the male, obviously from the greater breadth of the pelvis.†

DIAGNOSIS.—1. Femoral hernia may be distinguished *from the inguinal* by observing that Poupart's ligament can be traced over the neck of the sac, and that the spinous process of the pubes lies internal to it; whereas it is the reverse in the inguinal hernia. Besides, the femoral is generally much smaller. Supposing that a large femoral hernia is so fixed that it will not allow the course of Poupart's ligament to be traced, the diagnostic mark pointed out by James, of Exeter, may be attended to, to wit, that an inguinal hernia descends towards the labium, a femoral may mount up to near the spinous process of the ilium.*

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* Luke, Med. Chir. Trans., vol xxxi., p. 108.

† Mr. Partridge informed the author that he had met with a case of femoral hernia, protruding below Poupart's ligament, external to the vessels.

2. *Psoas abscess* resembles this hernia in its situation, in dilating on coughing, and diminishing when the patient lies down. The points of distinction are, that it is generally more external, that it fluctuates, but does not feel tympanitic, and that it is attended with symptoms of disease of the spine.

3. *Varix of the femoral vein* also resembles this hernia, inasmuch as it dilates somewhat on coughing, and diminishes when the patient lies down; but then if pressure be made below Poupart's ligament, the swelling quickly reappears, although it must be evident that under such circumstances a hernia could not come down.

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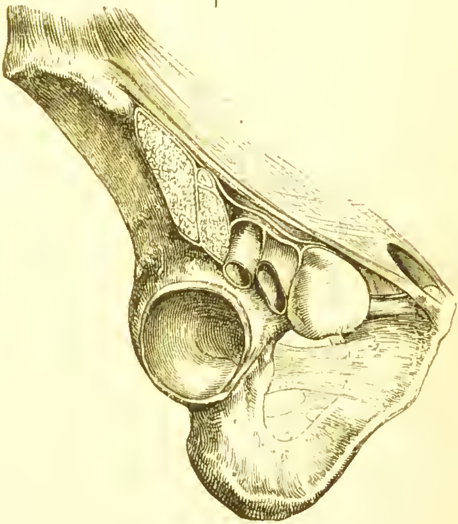

4. *Bubo and other tumours of the groin* may in most cases be recognised by their general character and history, and by their being unattended with symptoms of inflammation or obstruction of the bowels. But if there be any such swelling, and symptoms of strangu-

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* James, On Operations for Strangulated Hernia, &c., Lond. 1859, p. 10.

† The cut, taken from a preparation of Mr. Fergusson's in the King's College Museum, shows a femoral hernia with its relation to the other parts which pass under Poupart's ligament. Externally are seen sections of the iliacus and psoas muscles, with the crural nerve between them; then the femoral artery and vein; next the hernia, which passes through a small aperture occupied by an absorbent gland in the normal state, and is bounded by Gimbernat's ligament on its inner side. The hernia passes downwards in the sheath of the femoral vessels, separated, however, from the vein, as that is from the artery, by a process of cellular tissue. The sheath of the vessels is continuous above with the fascia transversalis.

lation as well, an incision should certainly be made to examine it; for there may be a tumour that may be satisfactorily proved to be an enlarged gland, and yet there may be a small knuckle of intestine strangulated behind it.

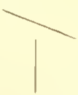
5. Lastly, the possibility of there being a strangulated *obturator hernia* behind the femoral hernia should not be lost sight of.

TREATMENT.—1. The *reducible* femoral hernia should be supported by a truss, the pad of which should tell against the hollow which is just inferior and external to the spinous process of the pubes. This hernia is very seldom, if ever, cured radically.

2. The *irreducible* should be supported by a truss with a hollow pad; or perhaps (if it be omental) the pressure of a common pad may be borne.

3. The femoral hernia, when *strangulated*, gives rise to much severer symptoms than the inguinal does, because of the denser and more unyielding nature of the parts which surround the neck of the sac. In performing the taxis, the patient should be placed in the usual position, with the thigh of the affected side much rolled inwards, and crossed over towards the other side. The tumour should first be drawn downwards, from the anterior part of Poupart's ligament, and then be pressed with the points of the fingers backwards and upwards. If, however, the taxis and chloroform do not soon succeed, the operation should be resorted to.

The old operation.—In the first place, the skin must be divided. Some surgeons make one simple perpendicular incision. Sir A. Cooper directs one like an inverted ⊥; Mr. Liston prefers making one incision along Poupart's ligament, and another falling perpendicularly from its centre over the tumour, thus:



The skin may be very safely and expeditiously divided by pinching it up into a fold, and running the knife through it with its back towards the sac. Mr. Fergusson sometimes makes one like an inverted ⅄, so that the skin can be turned back in three flaps; after which the succeeding layers may be divided by a simple longitudinal incision. Then the different cellular layers down to the sac must be divided by the bistoury and director, as in the inguinal hernia, and the sac must be opened with very great care, because it is generally very small, and embraces the bowel tightly, and seldom contains any serum or omentum. Then the finger should be passed up to seek for the stricture, which, according to Sir A. Cooper and Mr. Liston, will be generally found to be the *inner edge of the falciform process.* This must be gently divided for a line or two, the incision being directed *upwards and a little inwards*, towards the spinous process of the pubes. It must be recollected, that if this incision were carried too far, the spermatic cord in the male, or round ligament in the female, would be injured. If, however, the stricture is not released by that incision, a few fibres of Gimbernat's ligament must be divided.

2. The operation without opening the sac is described by Mr. Luke thus. After premising that the seat of stricture is sure to be at or near

the femoral ring, and that it is sometimes caused by bands of fascia propria, half or three-quarters of an inch below the ring; and that the upper boundary of the tumour on the abdominal surface is often marked by a visible depression, or at least that it can be felt by the fingers: "a fold of integuments," he continues, "is to be pinched up at that part, and divided by transfixing it with a narrow knife, so that the incision, when the skin is replaced, shall fall perpendicularly to the body, with its centre opposite to the depression referred to. By a few strokes of the scalpel the tendinous expansion of the abdominal muscle is to be laid bare; after which a finger should be introduced as far as Poupart's ligament, between the tendinous expansion and the tumour, where the latter rises upon the former. The ligament being thus exposed, a hernia-director is guided under it by the finger into the femoral ring, the margin of which may be safely and easily divided in an upward direction with a common probed bistoury, and the taxis applied in the usual way. Should the margin of the ring have formed the stricture, the taxis for the most part succeeds very readily, and the operation is completed in a very short time. But should the stricture be caused by the bands of fascia propria referred to, the director will have passed over them as it entered the femoral ring, in which case any amount of division in an upward direction will be of no avail. When the taxis does not succeed readily, these bands of fascia may generally be suspected to be the cause of failure. The fact may be made sufficiently clear by introducing the finger upon the neck of the sac, under Poupart's ligament, while the body of the sac is pressed between the fingers and thumb of the other hand, when it will be discovered that no impulse is communicated to it by such pressure. By a little attention the bands may be detected crossing the neck of the sac from half to three-quarters of an inch below the ring, and may be divided by insinuating the nail of the forefinger of the left hand under them from above, and by carrying the point of a probed bistoury along the nail, with its blunt edge towards the sac. The division is made by the surgeon drawing the bistoury away from the sac towards himself, a proceeding which, if properly performed, avoids all danger of wounding the sac or its contents."*

3. *Mr. Gay's Operation,* respecting which Mr. Fergusson says emphatically that he scarcely ever performs any other for crural hernia, and that, "if the sac is not opened, it is the nearest reasonable approach to the taxis that surgery has yet made," is thus performed: An incision, rather more than an inch long, is made near the inner side of the neck of the tumour. The superficial fascia having been divided, the forefinger (of the left hand if the hernial tumour is on the right side, and *vice versâ*) is to be passed through this wound, along and close to the side of the hernial tumour, to its neck. On the finger, a *bistouri caché* is to be passed through the cribriform fascia, and through the crural canal to the ring. "By the least amount of force, and with the aid of

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* Med. Chir. Trans., vol. xxxi., p. 112.

a little gentle compression of the inner side of the tumour by the finger, the point of the bistoury may be insinuated between the *sac* and the pubic margin of the *ring;* the edge of the knife is then to be turned towards the pubes, and by projecting the blade, the seat of stricture in that direction may be effectively divided." If, after this, and after the division of any other stricture that may be felt around the neck of the sac, the hernia cannot be reduced, the incision can be enlarged, and the operation of opening the sac, as usually directed, be performed.*

SECTION VIII.—THE UMBILICAL, VENTRAL, AND OTHER REMAINING SPECIES OF HERNIA.

I. UMBILICAL HERNIA—(*exomphalos*)—is, for obvious reasons, most frequent in children soon after birth. It is also not uncommon in women who have frequently been pregnant, although, in many of the so-called umbilical herniæ in adults, the hernial aperture is really not at the umbilicus, but a little on one side of it. The coverings of this hernia are skin, superficial fascia, and sac; they are always very thin, and not unfrequently the sac is adherent to its contents.

Treatment.—If *reducible*, and the patient an infant, the best plan is to place a hemisphere of ivory with its convex surface on the aperture, and retain it there with cross strips of plaster, and a bandage round the belly. A pad of linen, covered with sheet lead, will do as well. An adult should wear a truss or elastic belt, with some contrivance to prevent it from slipping down below its proper level. For the irreducible umbilical hernia a large hollow pad should be worn. If it becomes strangulated, and the patient is aged, and the strangulation was preceded by constipation, purgatives and copious enemata should have a fair trial. If the operation is necessary, an incision should be made over the neck of the tumour through the skin (which is very thin), and the tendinous parts be divided, and the bowels returned without opening the sac, if possible.

II. VENTRAL HERNIA is that which protrudes through the *linea alba*, or through the *lineæ semilunares* or *transversæ*, or in fact through any other parts of the abdominal parietes, save those which are the ordinary seats of hernia. It may be a consequence of wounds or bruises. Its treatment requires no distinct observations; but if it should ever be necessary to operate for the relief of strangulation, care must be taken to avoid the epigastric artery.†

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* On Femoral Ruptures, with a new mode of operating, &c., by John Gay Lond., 1848.

† Mention is made in the Lond. Med. Gaz., 21st Oct., 1842, of an adipose tumour, situated between the peritonæum and abdominal muscles, and projecting through an aperture in the linea alba, through which it could be pushed back, so that it completely simulated a hernia. Such a case, if complicated with peritonitis, might render the diagnosis very obscure; but an incision would clear up the mystery.

III. PERINÆAL HERNIA descends between the bladder and rectum, forcing its way through the pelvic fascia and levator ani, and forming a tumour in the perinæum.

IV. VAGINAL HERNIA is a variety of the preceding, in which the tumour projects into and blocks up the vagina, instead of descending to the perinæum.

V. LABIAL or PUDENDAL HERNIA descends between the vagina and ramus of the ischium, and forms a tumour in one of the labia. It is to be distinguished from inguinal hernia by the absence of swelling at the abdominal rings. These three herniæ must be replaced by pressure with the fingers, and be kept up by pads made to bear against the perinæum, and perhaps by hollow caoutchouc pessaries worn in the vagina.

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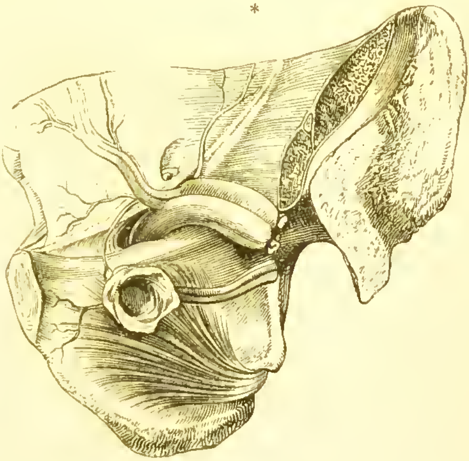

VI. OBTURATOR or THYROID HERNIA projects through that aperture in the obturator ligament which gives exit to the artery and nerve. In a fatal case related by Mr. Howship, in which a very small piece of intestine was strangulated in this opening, the patient complained of great pain down the leg in the course of the obturator nerve. This might be an aid in the diagnosis. In a case in which Mr. Hilton laid open the abdominal cavity, and disengaged a knuckle of intestine from the obturator foramen, there were no symptoms that indicated the kind of obstruction met with.† In a case successfully operated upon by

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* From a preparation of Mr. Fergusson's in the King's College Museum.

† This case, like most others, was unfortunately operated upon too late. The obstruction existed from the 20th January to the 1st February. Hilton, Med. Chir. Trans., vol. xxxi, p. 323 ; Obrè, Ranking, vol. xiv. ; Report of cases in Lancet, for 1851, vol. i., p. 512 ; Wilkins, Lancet, 1853, vol. i.

Mr. Obrè there were symptoms of strangulation, and a slight degree of fulness in the triangular space at the upper part of the right thigh compared with the left; and a distinct hardness in the neighbourhood of the femoral artery behind the saphenous opening. Mr. Obrè made a straight incision, as in the operation of tying the common femoral artery, beginning three inches below Poupart's ligament, hoping to find intestine low in the crural canal. When the cribriform fascia was opened, and the saphenous opening exposed, no hernial sac was found, but a hard something could be felt lying deep on the inside of this opening. The dissection was continued downwards: the fascia lata divided; the pectinæus exposed and divided transversely for about an inch and a half, when a hernial sac was exposed, which rose up into the wound to the size of a pigeon's egg. The finger was passed into the obturator opening; the sac opened, and found to contain small intestine; the edge of the aperture slightly divided, (in doing which the saphenic vein was wounded, and was tied,) the intestine was returned, and the patient did well.

VII. ISCHIATIC HERNIA protrudes through the sciatic notch. This and the preceding are exceedingly rare; and the tumours are of necessity small. If discovered to exist during life, they must be returned and supported by proper apparatus—and if strangulated, the stricture must be divided by operation.

VIII. DIAPHRAGMATIC HERNIA is generally a result of congenital deficiency, or accidental separation of the fibres of the diaphragm. But it may also be caused by violent falls on the abdomen, or by violent pressure of any kind, capable of lacerating the diaphragm, and driving some of the bowels into the thorax.* It may also be a consequence of gunshot wounds. This form of hernia, if strangulated, will produce the ordinary symptoms—vomiting, constipation, and pain; and the distinction from the symptoms of ileus or intussusception—or from those produced when a fold of bowel is entangled in a rent in the omentum, or mesentery; or when the bowel is constricted by membranous bands resulting from previous inflammation of the peritonæum, will be very difficult, if possible. In a case recorded by Dr. Copeman, of Norwich, the patient had umbilical hernia, which was quite free from strangulation, but a portion of the stomach and omentum had escaped, through a rent in the diaphragm, into the left pleural cavity. This patient complained of pain in the left shoulder, and below the heart, and dyspnœa.

Mr. Guthrie had predicted, in his Commentaries,† the possibility of hernia through the diaphragm, after a gunshot wound, and had described the operation which might be attempted for its reduction: that is, an incision through the walls of the abdomen, large enough to admit the hand to draw back the stomach into its proper place. He informs the writer (Jan. 1856) that he has received from the Crimea an interesting account of a gunshot wound, in which the greater part of the stomach and duodenum protruded into the chest through a wound of the diaphragm caused by a Minié ball.

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* Reid on Diaphragmatic Hernia, Edin. Med. and Surg. Journ., Jan. and July, 1840; Copeman, Prov. Med. Journ., 1855.

† Sixth ed., 1855, p. 505.

CHAPTER XIX.

SURGICAL DISEASES AND INJURIES OF THE RECTUM AND ANUS.

I. Foreign Bodies in the rectum sometimes require to be removed by surgical art. They may consist either of small bones or the like that have descended from above, or of pins, glyster-pipes, or other bodies introduced from below. Substances of very extraordinary dimensions (a blacking-bottle, for instance), have been forced into the anus. The grand point is first to dilate the bowel well, by passing in several fingers coated with lard, or by means of a speculum, and then a proper forceps, or a lithotomy scoop, may generally be used with success.

Several *specula* have been invented for the purpose of enabling the surgeon to see into the anus; to remove substances from within, or to make medicinal applications, or to perform operations. The simplest is a glass tube, silvered and covered with caoutchouc, of various sizes, and having various kinds of apertures to allow of the inspection of the mucous membrane. This was invented by Mr. W. Fergusson. A very complete three-valve speculum has been devised by Mr. Lane, and is made by Savigny. Others are made by Coxeter, and other mechanicians.

II. Imperforate Anus (*Atresia ani*) signifies a congenital closure of the rectum, and may occur in various degrees. The anus may be merely closed by thin, fine skin, which soon becomes distended with meconium; or the gut may terminate in a blind pouch at any point from the sigmoid flexure downwards, the anal aperture being altogether wanting; or the anus may be open for an inch or two, with an obstruction beyond; or the rectum may terminate in the bladder, or urethra, which will be known by the escape of urine tinged with meconium; or, although the anus may be closed, there may be a fistulous track leading from the rectum just above it, and opening somewhere in the perinæum.*

Treatment.—If the end of the intestine can be felt protruding when the child cries, a free crucial incision may be made into it without delay: if it cannot be felt, a day or two should be waited, so that it may become distended with meconium, and then a cautious incision should be made with a double-edged bistoury, in the direction of the curve of the sacrum. If it succeed in reaching the bowel, the aperture should be kept open by a bougie.

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* Case in South's Chelius, vol ii., p. 329.

But if this operation should fail in reaching the bowel, or if the rectum appears to be altogether deficient, the only resource is the *formation of an artificial anus* in the left loin (p. 509). When the rectum opens into the bladder or urethra, an aperture must be made into the neck of the bladder for the free discharge of the fæces,* if the natural orifice cannot be restored.

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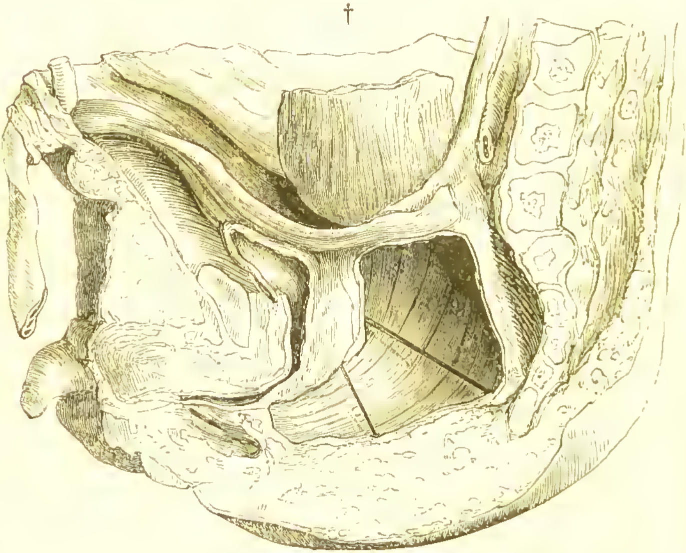

III. SPASM OF THE SPHINCTER ANI is known by violent pain of the anus, with difficulty of evacuating the fæces. On examination, the muscle feels hard, and resists the introduction of the finger. This affection may be caused by constipation of the bowels, or disorder of the health. It may occur in sudden paroxysms which soon go off; or may last permanently, and lead to organic thickening and stricture of the anus. It is very frequently connected with piles, or with fissure of the anus, or ulcer just within it.

PROCTALGIA, or neuralgia of the anus, is a very common disorder of children and of gouty adults, and in either case is best treated by purgatives.

IV. FISSURE OF THE ANUS is a small chap or crack giving intense pain during the passage of the motions, frequently continuing two, four, or even eight hours after the evacuation. Introduction of the finger causes greater suffering in this than in any other affection of the rectum; and if unrelieved, fissures often enlarge and assume the character of ulcers. A piece of hypertrophied skin, probably the remains of an external pile, and generally situated behind, leads, in many instances, to the fissure. Immense relief is produced by free purgation. If, after a fair trial of purgatives, and the local use of sulphate of copper, nitrate of silver, or of tannin lotion, or ointment of galls with lead, the symptoms continue unabated, recourse must be had to the knife.

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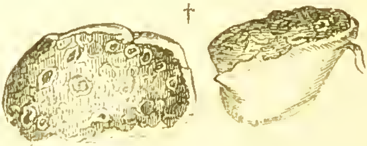
* Case in Fergusson's Pract. Surg., 3rd ed., p. 720.

† Imperforate anus. From the King's Coll. Museum.

V. ULCER OF THE RECTUM, if influenced by the sphincter muscle, is seldom cured without the use of the knife. If, however, it be situated at a distance, and out of reach of the action of the muscle, it may heal up by the local application of stimulants, and attentive regulation of the bowels.

In the first place, probably a dose or two of calomel, followed by castor-oil, should be administered, and after this blue pill, dandelion, nitro-muriatic acid, and such other remedies as may be necessary to bring the secretions into a healthy condition. 2. Meanwhile, an attempt may be made to soothe the local irritation by washing out the rectum with a pint of thin arrowroot and water after a motion; or by injecting, by means of a glass syringe, about two fluid drachms of glycerine; or by using a lotion of borax and extract of poppies, F. 122, or belladonna liniment, F. 149. 3. Stimulating applications, such as nitrate of silver and citrine ointment, may be tried to the fissure or ulcer. 4. Other means failing, an incision should be resorted to. The left forefinger should be introduced, and a straight, narrow, blunt-ended bistoury by its side; with the latter, an incision should be made through the fissure, or ulcer, so as to divide the mucous membrane, and in severe cases, part of the sphincter. A little flake of cotton wool should then be laid in the wound, so that it may heal by granulation.*

VI. HÆMORRHOIDS, or PILES, are small tumours situated near, usually within, the anus. They consist of folds of mucous and submucous tissue in various stages of inflammatory swelling, congestion, infiltration, or permanent hypertrophy, and usually contain enlarged veins.



Sometimes there is a little varicose knot with the cellular tissue around thickened. Sometimes the blood in a dilated vein coagulates, forming a solid tumour with the thickened cellular tissue around. Again, the mucous membrance of the whole circumference of the

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[*] See observations by Richard Quain, F.R.S., quoted in Ranking's Abstract, vol. xvi.

[†] Piles after excision, showing the dilated veins, of which they are in a great measure composed.

bowel becomes swollen and hypertrophied, with its surface extremely vascular and sensitive. This swollen membrane is apt to become prolapsed, or, in plain English, to come out at every evacuation of the bowels; causing great pain from being compressed by the sphincter until fairly put back into its place, and bleeding freely from the straining and pressure. Lastly, there may be one or more distinct pendulous tumours, varying in size from that of a pea to that of a walnut, of a pale or reddish-brown colour when indolent, but dark or bright red when congested or inflamed. These add greatly to the discomfort and tendency to prolapse.

External Piles may be met with, 1. in the form of round hard tumours just at the margin of the anus, and covered half with skin and half with mucous membrane; or, 2. of oblong ridges of skin external to the sphincter, commonly called *blind piles*.

Symptoms.—Piles may be met with in two states—*indolent* or *inflamed*. When *indolent*, they produce the inconveniences that necessarily result from their bulk and situation, and from getting within the gripe of the sphincter; more or less pain in defæcation; prolapse; and if not pain, yet a sense of weight and discomfort that is excessively annoying, and that renders the mind inapt for matters requiring deep thought. Sometimes, too, the bowel is apt to come down when the patient is taking exercise or exerting himself. When *inflamed*, they occasion the following symptoms: Pain, heat, itching, fulness, and throbbing about the anus—a sensation as if there were a foreign body in the rectum—pain and straining in passing evacuations. These symptoms may, in violent cases, be complicated with irritation of the bladder, frequency of micturition, pain in the back, pain and aching down the thighs. The young surgeon should remember, that a patient with piles may not be aware of the nature of his complaint, or through delicacy may abstain from mentioning it. Whenever, therefore, a patient complaints of unusual irritation of the bladder, or of symptoms of dysentery—that is to say, frequent, painful, and unsatisfactory efforts to pass motion—the surgeon should always make inquiries after piles. In women, piles may cause aching of the back, uterine irritation, with mucous discharge, and many anomalous symptoms, which the surgeon will in vain endeavour to cure until he finds out the real cause. The hæmorrhage from piles will be treated of more particularly at page 548.

Causes.—The *predisposing causes* are any circumstances that produce fulness of the abdominal vessels, or that impede the return of blood from the rectum—such as luxurious and sedentary habits of life—pregnancy, constipation, and disease of the liver. The *exciting causes* may be anything that irritates the lower bowels—particularly straining at stool—and violent doses of purgative medicines; among which aloes is blamed more than it deserves to be. Since this medicine is so valuable and in such common use, and yet so little understood, the writer will, for the sake of his younger readers, state briefly what the use of aloes is, and in what its misuse consists.

Aloes is what was formerly called an *eccoprotic;* that is, an expeller of fæces. When taken into the stomach it is readily dissolved and absorbed, and is eliminated through the colon and rectum, which latter parts it stimulates to unload themselves of their contents; and if they contain fæcal matter, which from torpidity they do not expel, aloes is an effectual and unirritating remedy. But if these parts are already active and empty, aloes can but irritate them fruitlessly, causing straining and tenesmus, and also probably piles. Lastly, piles are most frequent in women, and are rare under puberty.

General Treatment.—The grand objects are to remove the predisposing and exciting causes. The patient, if stout, plethoric, and of sedentary habits, ought to live abstemiously, and take plenty of exercise. The bowels should be regulated by some mild aperient, capable of producing daily copious soft evacuations without straining or griping. Senna, sulphur, cream of tartar, and magnesia, in the form of electuaries, F. 46—55, or compound colocynth pill, are frequently used for this purpose; or pills of rhubarb and soap, with ipecacuanha, taken twice a day, F. 52; or a small dose of castor-oil or Pullna water, F. 42, in the morning. It is a good plan to inject the rectum with cold water both before and *after* the motions. In some cases it is advisable that the patient have his regular daily evacuation at night, just before bedtime, so that the prolapsed and irritated parts may have time to become quiescent during the night. In cases of long standing, in which the mucous lining of the rectum is relaxed, cubebs, or Ward's paste, or the confect. piperis. comp. may be given with great benefit in doses of ʒj ter die. In similar cases, especially if the patient is advanced in years, and the piles are attended with a flow of mucus, copaiba may be given in the dose of thirty or forty drops every morning in milk; and a scruple of common pitch may be taken in pills every night at bedtime. Old people rarely dislike the taste of copaiba.

If the *piles are inflamed,* leeches to the anus, or cupping on the sacrum, a dose of calomel and opium at bedtime, followed by castor-oil in the morning; low diet, rest in bed, warm hip-baths, fomentations, and poultices. Cold lotions of lead, with a little laudanum, may be substituted for the warm applications, if more comfortable. If there is a tense, bluish, solid tumour, evidently containing coagulated blood, it *may* be punctured; but perhaps it is better not to do so.

Local Treatment.—Having by the general treatment provided as far as possible against the original causes of the malady, it is the surgeon's duty to use such local measures as shall tend to restore the part to a healthy condition; amongst which we shall mention, 1. *perfect cleanliness.* The anus should be well washed with soap and water after each motion; and if the piles are internal, and protrude during evacuations, they should be washed before they are returned.

2. *Astringents.*—The zinc lotion, F. 117; or iron lotion, which is particularly recommended by Mr. Vincent, F. 128; or lotions of alum or tannin, of either of which a drachm or two may be injected into the

anus after each motion, and be allowed to remain; the gall ointment, with or without lead, F. 162, and creosote ointment—are often of benefit. Dr. Burne recommends an ointment composed of pulv. hellebori nigri ʒj adipis ℥j, which he says never fails of affording great relief, although exceedingly painful for a time. An ointment of a drachm of black oxide of mercury to an ounce of lard has also received high recommendations.

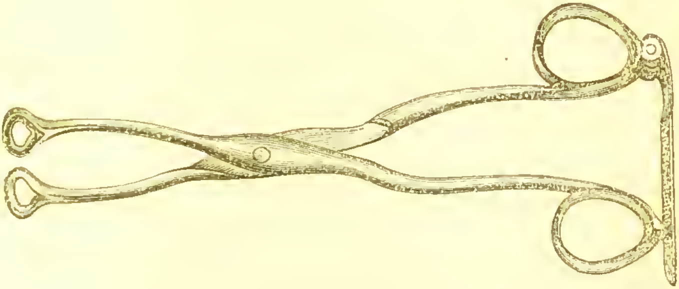
3. *Pressure* by means of a bougie introduced occasionally, or a firm pad of flannel, covered with oiled silk; or a pad of smooth wood or of ivory, made to bear up well against the anus by means of a stout perinæal or T bandage (see Bandages), or by means of a spring like that of a truss, are often of service. There is an instrument consisting of a short egg-shaped ivory bougie, which is introduced into the anus, and which is attached by a slender neck to an ivory pad; so that pressure is thus made both internally and externally, that may be useful in cases of internal piles with relaxed mucous membrane, and tendency to prolapse, when no measure for removing the piles is thought advisable.

4. But the most safe, speedy, and effective means of affording relief in cases of internal piles is the *nitric acid;* which was originally recommended by Dr. Houston, in order to destroy the tender, tumid, and bleeding surface of mucous membrane which covers them, and which is the source of their excessive irritability and hæmorrhage. The bowel having been protruded, the diseased surface is to be wiped with lint; and a portion of it, the size of sixpence, to be deliberately *dabbed* with a smooth wooden stick dipped into the concentrated acid. When this has taken effect, any superfluous acid is to be mopped up, lard is to be applied copiously, in order to prevent the caustic being too widely diffused, and the parts are then to be returned within the sphincter. The patient should go to bed, and the bowels be kept quiet —if necessary by opium—for forty-eight hours; and when the slough caused by the acid separates, the surface generally cicatrizes speedily, and leaves the part braced up and contracted. It is difficult to exaggerate the benefits of this plan of treatment. It seldom causes pain or any ill consequences. The author has by two applications of it relieved a patient permanently of pain and hæmorrhage which had lasted for years, and which on the average caused him to lose two hours' time every morning, by rendering him incapable of attending to anything save his own miserable sensations. When the parts cannot be protruded, the acid may be applied through the speculum.

5. *The Ligature.*—But the acid will not be a sufficiently potent remedy if there are one or more actual tumours, or if a large track of mucous membrane is swelled and protrudes. For such cases, any tumours, together with a portion of relaxed mucous membrane, should be extirpated, and the ligature is the usual means of effecting it. But the surgeon must bear in mind that it is highly dangerous to operate upon internal piles if the health is broken, or if there is any organic disease of the liver or kidneys; and the operation must both be pre-

ceded and followed by a course of the most regular diet, and medicines to maintain the secretions, and to remedy any disorder in the health.

The operation is performed as follows:—The bowels having been just previously cleared, the patient must be told to protrude the piles; and if he cannot do it easily, he should sit over a vessel of warm water, or have an enema of warm water. Then (the patient having chloroform to render him unconscious of pain, and to relax the sphincter) the piles should be seized one by one and drawn out, and a small fine piece of hempen twine be tied as tightly as possible round the base of each. They may be seized with any forceps; but one like that here depicted is very convenient. If one of the tumours is large, a double ligature may be passed through its base with a needle, and either half be tied separately. Before finally tightening the ligatures, the piles should be slightly punctured. Any fold of superfluous membrane should be similarly seized and dealt with; and the surgeon should take care, whilst about it, to tie up enough; to tie it in small portions so that it may quickly slough off; and to tie it so tightly as to kill it at once. After the operation, the ends of the thread should be cut short, and be returned into the rectum. The patient should remain in bed, and the bowels should not be disturbed for forty-eight hours after the operation. Pain is to be relieved by an opiate, F. 32; and if it persist, the piles should be examined to see whether the ligatures remain as tight as possible, and if not, they should be reapplied.



6. *Excision* is the proper remedy for external piles. All loose ridges of skin around the anus should at the same time be removed with the scissors, and the edges of the cut be brought together by a fine suture. To apply the ligature to the skin is barbarous. For internal piles, excision, although a cleaner and more summary, cannot be considered so safe an operation as tying, because of the great risk of hæmorrhage, and the difficulty of checking it unless certain precautions are taken. It may, however, be done quite safely thus:—The tumour having been protruded, the base of it should be transfixed by a long needle, which will prevent it from returning into the anus. Then it may be cut off; and the cut surface being exposed to the air, will not

bleed, or if it does, it is easy to apply cold, astringents, or ligatures. After twelve hours the needle may be removed, and the part allowed to go up. Mr. Henry Lee has adopted a plan of seizing the part to be removed between the blades of a sort of curved forceps, and cutting it off; then touching the cut surface with nitric acid, or, still better, with the iron at a black heat. The pressure of the forceps prevents all bleeding at the time, and the caustic not only prevents it afterwards but also renders the patient more safe from pyæmia (which is one possible risk of the ligature), hastens the cure, and leaves the parts more braced up. The *ecraseur* may be used in some cases.

VII. Warts and Condylomata. See p. 204.

VIII. Hæmorrhage from the rectum is a very frequent concomitant of piles, and may be of two kinds. In the first place, it may be caused by the bursting of a varicose vein: in which case the blood is venous; and the hæmorrhage in general occurs at once in considerable quantity; and may never occur again. This form is rare. But far more frequently it proceeds from the vascular surface of internal piles, which gives way under the straining which accompanies defæcation. In the latter case the blood is arterial; it is squirted from the anus in jets when the patient is straining at the water-closet, and the bleeding occurs very frequently, especially when the body is feverish, or the bowels disordered, or the piles inflamed. Hæmorrhage from the rectum may be distinguished from that which has its source higher up by noticing that the blood is generally of a florid hue, and that it covers the fæces, but is not intimately mixed with them.

Treatment.—1. If the hæmorrhage is moderate in quantity, if it has been of habitual or periodic occurrence, if it induces no weakness, and if it brings relief to pain in the head or any other feeling of disorder, before suppressing it the patient must be made to adopt a course of exercise, temperance, and aperient medicine. 2. But if the patient is weak and emaciated; if the lips are pale, and the pulse feeble, the bleeding should be at once suppressed. (We may observe here, that whenever a patient applies for relief in consequence of violent palpitations and shortness of breathing, or giddiness and swimming in the head—if the lips are pale, and the extremities tend to swell—the surgeon should always inquire for piles, because, as we before observed, some patients, through false delicacy, will not mention them.) Or if the bleeding, as sometimes happens, instead of relieving symptoms of heat and fulness in the rectum, aggravates them, it should be stopped, whatever the patient's complexion may be; and if he is of a full habit, he should live abstemiously, and keep the bowels open. The means of checking hæmorrhage from the rectum are, 1. That piles, if any exist, should be treated as we have just directed. 2. Astringent applications, such as injections of dec. quercus, or F. 128. 3. The internal remedies most likely to be of service are salts of iron or bark with sulphuric acid, or the balsams of copaiba and Peru. F. 9, 13, 14, 186, &c. 4. In order to stanch violent bleeding, the anus must be distended with a speculum, and any bleeding vessel be tied, or touched with a heated wire. Or the anus must be plugged.*

IX. DISCHARGE OF MUCUS—clear and viscid—without fæcal odour, may be caused by piles, ascarides, the use of aloes, or any other causes of irritation to the rectum. To be treated by mild aperients, astringent injections, and copaiba or cubebs. F. 37, 39, 13, &c.

X. ABSCESSES near the rectum may be caused by the irritation of foreign bodies, or by caries of an adjacent bone, but they are much more frequently the result of the various causes of disordered circulation in the hæmorrhoidal vessels that were mentioned as producing piles, and especially of that morbid state of mucous membrane which accompanies pulmonary tubercle or the tendency thereto. They may either be large and deep-seated, or small and superficial. 1. Deep-seated abscesses are attended with great aching and throbbing, difficulty and pain in evacuating the fæces, and fever, and on internal examination a fulness or fluctuation may be felt. If these abscesses are left to themselves, a vast quantity of matter may accumulate in the loose cellular tissue of the pelvis, and severe irritative fever result from its confinement. 2. Superficial abscesses are attended with more or less pain, tenderness, and throbbing, and swelling around the anus. Or either may be quite chronic and indolent.

Treatment.—In acute cases leeches and fomentations may be tried at first; but if they do not very soon remove the pain and tenderness, or if there is the least suspicion that matter is forming, a bistoury should be pushed home into the inflamed part, and if it be at all extensive, two or three punctures should be made.

XI. FISTULA IN ANO signifies a fistulous track by the side of the sphincter ani. It is extremely difficult to heal, both because the constant contractions of the sphincter and levator ani interfere with the union of its sides, and because of the passage of fæcal matter into it from the bowel. There are three kinds spoken of in books. 1. The *complete fistula*, which has one external opening near the anus, and another into the bowel above the sphincter, where it may be felt like a small papilla. 2. The *blind external fistula*, which has no opening into the bowel, although it mostly reaches its outer coat. 3. The *blind internal fistula*, which opens into the bowel, but not externally, although its situation is indicated by a redness and hardness near the anus; or perhaps the aperture is so small as to be scarcely perceptible.

This affection is a common result of abscess by the side of the rectum. Brodie's opinion is, that it always commences with an ulceration of the mucous membrane of the rectum, and an escape of fæcal matter into the cellular tissue, which gives rise to abscess, and the abscess to fistula. But most other surgeons believe that it may be the result of abscesses around the anus, which have no connection with the rectum. Besides, there may be openings near the anus, leading from the tuber ischii, which may be carious.

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* In severe bleeding, occurring after an operation on the rectum, after the failure of more ordinary means, a plug of the following description may be used. A good-sized conical cork, with a string passed through its centre, is to be placed in the rectum, then graduated circular pieces of lint penetrated by the string must follow: two or three pieces of lint can be passed at a time, and the entire number must be sufficient to form a good-sized conical plug, which is prevented from floating about in the rectum by traction on the string. Firm pressure over a large space can be obtained by the adoption of this method. For this note, the author is indebted to Mr. Sharman, some time of St. Mark's Hospital, now of the London Hospital.

Treatment.—The grand remedy for this affection is division of the sphincter ani, so as to prevent contraction of that muscle for a time, and division likewise of the internal orifice if any. The digestive organs and secretions must first be put into good order, and the bowels be well cleared by castor-oil and an injection, so that they may not want to be disturbed for two or three days. *Operation.*—The patient being placed on his knees and elbows on a bed, or being made to kneel on a chair and lean over the back of it, or lying on his side close to the edge of the bed, and the nates being kept asunder by an assistant, the surgeon introduces his left forefinger into the anus, and at the same time explores with a probe the whole extent and ramifications of the fistula. If it is of the *blind internal* kind, its situation must be ascertained, and a puncture be made into it by the side of the anus. Perhaps a probe bent at an acute angle may be passed into it from the bowel, and serve as a guide for the puncture. Then, one forefinger being still in the anus, the surgeon passes a strong curved probe-pointed bistoury up to the further end of the fistula. Next (if the internal opening cannot be found) he pushes it through the coats of the bowel, so that its point may come in contact with his forefinger. Then he puts the end of his forefinger on the point of the bistoury, and draws it down out of the anus; and as soon as it is fairly emerged, he pushes the handle towards the orifice of the fistula, so as to divide skin, sphincter, and bowel at one sweep. Sir B. Brodie recommends that the bistoury should always be passed through the internal opening of the fistula, and says that the affection will very likely return if this is not divided; he also condemns the practice of cutting through the bowel higher up than this opening; but all ramifications and burrowings of the fistula under the skin should be slit up. A little flake of cotton is then to be placed in the wound, and the patient to be kept in bed for three days. The subsequent treatment consists in the use of perfect cleanliness, and the daily introduction of a little flake of cotton (which may be dipped in some stimulating lotion if necessary) between the edges of the wound for the first few days, so as to prevent its edges from uniting, and to cause it to granulate from the bottom. If hæmorrhage prove violent after this operation, and does not yield to the application of cold, or a bit of matico leaf, the anus must be well dilated with a speculum, so as to expose the bleeding surface to the air, and any artery discernible may be tied; or else it may be firmly plugged with lint, which is to be secured by a T bandage.

If the patient will not submit to this operation, or if he is labouring under disease of the lungs or liver or kidneys, in an advanced stage, so that it would be unsafe, the treatment must be *palliative* merely. The confect. piperis, or copaiba and tonics, may be administered internally, and stimulating injections and ointments be applied to the fistula. Luke's operation of cutting the fistula by ligature may be adopted by any one who is fond of variety, or whose patient fears the cold knife.

XII. Prolapsus Ani consists in an eversion of the lower portion of the rectum, and its protrusion through the anus. It is not merely that a fold of the mucous membrane protrudes; but that the muscular coat, and whole thickness of the bowel come down. This affection is most common in infancy and old age. It may depend on a natural laxity and delicacy of structure, or be caused by violent straining, in consequence of costiveness, or of the existence of piles, or stone, or stricture.

Treatment.—Whenever the protrusion occurs, the parts should be carefully washed, and then be replaced by pressure with the hand. If there is any difficulty in doing so, the forefinger oiled should be pushed up into the anus, and it will carry the protruded part with it. If, however, as sometimes happens, a larger portion than usual has come down, and it is so swelled and tender from the constriction of the sphincter, and from being irritated by the clothes, that it cannot be returned, the patient should be put under chloroform, and so reduction be effected; but should the prolapsed portion come down again, the patient must keep in the recumbent posture, and assiduously apply iced water In other cases, leeches, fomentations, and a dose of calomel and opium may be requisite.

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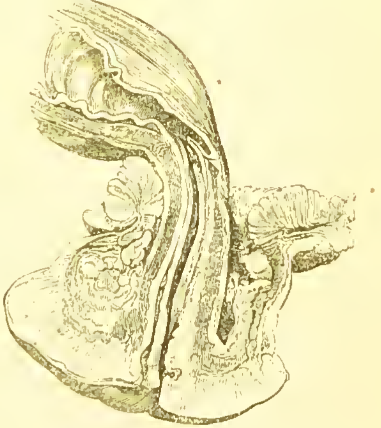

To cure this affection radically, the bowels should be so regulated as to prevent costiveness and straining; injections of dec. quercus, or of F. 128; sponging with cold water—tonics, especially steel, and support by pads and T bandages, may be used to give tone to the parts—and piles, or any other source of irritation, must be removed by appropriate remedies. Dr. MacCormac of Dublin recommends that when the stools are passed, the skin near the anus should be drawn to one side with the hand, so as to tighten the orifice: this the author believes to be a very valuable suggestion. But if the diligent employment of these measures is of no avail, certain operations may be resorted to. 1. The mildest consists in pinching up two or three folds of the flabby mucous membrane on the protruded bowel with the forceps shown at p. 547, and tying them tightly with ligatures. 2. Or ligatures may be passed by needles through several folds of skin just at the margin of the anus, which are then to be tied up tightly. Or 3, a small patch of relaxed mucous membrane may be destroyed by acid. Either of these operations may be repeated as often as necessary. Their effect in producing adhesion and consolidation of the relaxed tissue must be obvious. There is a French operation, which consists in excising a portion of the sphincter ani; but when this operation used to be performed (as it commonly was sixty years ago) for fistula, it was often followed by inability to retain the fæces.

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* This cut, from a preparation in the King's College Museum, shows a section of a prolapsed rectum—the whole circumference of the lower part of the bowel being everted and extruded. The mucous membrane is excessively thickened from the irritation of exposure.

XIII. INTERNAL PROLAPSUS, or INVAGINATION OF THE RECTUM.—When the lower bowel in females has become distended, and has lost its tone from protracted constipation, and the abuse of warm enemata, the upper part of the bowel is apt to come down within the lower, and to be gripped by it after the manner of an invagination. This state of things causes great distress, constant feeling of weight and of desire to pass motions, and difficulty in so doing. On examination with the finger, the canal of the rectum is found obstructed by a tumour with a capacious *cul de sac* around it, and with the natural passage of the bowel in its centre. The writer has reason for believing that some degree of this affection is not very uncommon amongst women.

Treatment.—Aperients, such as rhubarb, with cubebs or cinnamon; or with small doses of nux vomica: mild astringent injections, and the bougie; the point of which should be carefully guided into the orifice in the centre of the prolapsed portion.*

XIV. SPASMODIC STRICTURE of the rectum—known by great difficulty in evacuating the bowels, with spasmodic pain on doing so—is a rare affection. "It generally depends," says Mr. Mayo, "on a vitiated state of the secretions; and is more frequently relieved by a regulated diet and alterative medicines, and the use of injections, than by the employment of the bougie." (See *Proctalgia.*)

XV. PERMANENT STRICTURE.—In this affection there is a chronic thickening and contraction of the mucous coat of the rectum, so as to form a ring encroaching on its canal. It is generally situated at from two inches and a half to four inches from the anus. More rarely it is met with higher up, or even in various parts of the colon. It may follow the contraction of cicatrised ulcers. The *symptoms* are great pain, straining and difficulty in voiding the fæces, which are passed in small, narrow, flattened fragments; and on examination the stricture may in ordinary cases be readily felt. Irritation of the bladder and uterus, and pains or cramps in the leg, with headache and dyspepsia, are occasional additional symptoms. If this affection be unrelieved, it leads to ulceration of the rectum above the stricture, with a consequent aggravation of all the symptoms, and death from irritation.

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* This malady is particularly described by Earle, Med. Gaz., vol. v.; Chevallier, Med. Chir. Trans., vol. x.; Mayo on the Rectum, p. 182; and Bushe on the Rectum, New York, 1837.

Treatment.—The remedies are aperients and injections so as to produce daily soft unirritating stools, and the bougie. A bougie, capable of being passed with moderate facility through the stricture, should be introduced once in three or four days, and be allowed to remain fifteen or twenty minutes; and its size should be gradually increased when a larger one admits of being passed. The best bougie is one invented by Mr. Partridge, made of a short cylinder of smooth metal, mounted upon a slender handle, so that the sphincter is not painfully distended. Instruments of every sort introduced into the rectum should be handled with the utmost gentleness. Nothing is gained by forcing a large bougie through a stricture. The cure is to be effected by the repeated and gentle stimulus of pressure, so as to excite absorption, not by mere mechanical dilatation. There are numerous fatal instances on record in which the bowel has been torn by bougies, and by that most dangerous and loathsome instrument, the common clyster syringe, in the hands of careless or ignorant people. For the administration of enemata, the pipe should be only an inch and a half in length, with a large bulbous extremity. Or if in cases of stricture, or of obstinate costiveness with great accumulation of fæces, or of incarcerated hernia, it is desirable to introduce a tube further, it should be quite flexible like that of a stomach-pump. But the natural sharp fold at the junction of the rectum with the sigmoid flexure, and the fact shown by Mr. Earle that the bowel not unfrequently makes a horizontal curve to the right before descending into the pelvis, render the introduction of bougies into the sigmoid flexure a very blind, hazardous proceeding, and one that is not often to be justified. Moreover the surgeon must be on his guard lest he fall by inadvertence into another error. That is to say, he must not pronounce his patient to have a stricture merely because the point of the bougie catches in the folds of the mucous membrane, or is obstructed by the promontory of the sacrum.

XVI. POLYPUS of the rectum, a rare disease; must be removed by ligature, or by knife, or the ecraseur.

XVII. CANCER of the rectum is usually of the scirrhous variety, and situated at first about two or three inches above the anus. It may either commence as a distinct tumour, or as an infiltration of some part of the walls of the bowel. The earliest symptoms are uneasiness in the rectum, with a sense as if some fæcal matter had lodged there; aching and pain in the back, hips, and thighs, and irritation of the bladder. As the disease advances, the bowel becomes more or less obstructed; there is frequent discharge of a fetid muco-purulent matter streaked with blood; and there is a most obstinate constipation, attended with enormous swelling of the abdomen, and sometimes with all the symptoms of strangulated hernia; but this may alternate with the most profuse and exhausting diarrhœa. Abscesses about the rectum, opening perhaps into the bladder or vagina, aggravate the patient's misery, and death ensues from exhaustion, or from peritonitis, or perhaps from rupture of the distended bowels. This disease is to be distinguished by examination with the finger, or with the speculum; which will detect hardening and ulceration, or perhaps fungating tumours blocking up the gut.*

Treatment.—The first object is, to keep up the action of the bowels by enemata of warm water, and by the mildest laxatives: and to allay irritation by occasionally leeching the sacrum; by belladonna and opiate plasters; or occasional enemata or suppositories of opium, or large doses of henbane or conium; and by the tepid hip-bath. Sir B. Brodie recommends injections of linseed oil, either pure or mixed with lime-water, and balsam of copaiba with alkalis internally. When the obstruction threatens to become considerable, it will be expedient to use bougies, very gently, of the softest material, and not more frequently than is absolutely necessary. When these fail, it may be expedient, as a temporary resource, to cut through, or to excise some portion of the obstructing growth, or even to force the finger, or a flexible tube, through it, if possible with safety: some surgeons have even extirpated the lower extremity of the rectum; but all these operations can only be regarded in the light of palliatives. As a last resource, an artificial anus may be formed by Amussat's operation.†

For cancerous and epithelial diseases of the verge of the anus, and their treatment, by operation or otherwise, we may refer to the works of Lebert and Lisfranc.

XVIII. PRURITUS ANI, a very violent itching of the anus, is a very troublesome affection. It may be complicated with an excoriated or fissured state of the surrounding skin (*rhagades*). The best plan is, to keep the bowels open with sulphur, seidlitz powders, or castor-oil, with occasional doses of blue pill; to put the stomach into proper order; to bathe the part very frequently with water as hot as can be borne; and to apply some stimulating or astringent substance, such as nitrate of silver, weak solution of corrosive sublimate, the citrine or creosote ointment, or lemon-juice. The liq. arsenici chloridi, F. 97, may be tried in an obstinate case.

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* In a case related to the author by Mr. Mayo, of Winchester, ulceration of the anus, of the worst syphilitic character, laid open the peritonæum between the rectum and vagina: a portion of omentum protruded; it was imperfectly replaced, as it was supposed, naturally enough, to be a prolapse of the rectum, and the patient died with symptoms of strangulation.

† Walshe, op. cit., p. 297. Cæsar Hawkins, Med. Chir. Trans., vol. xxxv.

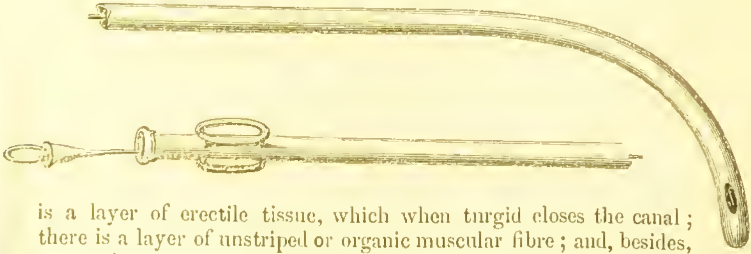
CHAPTER XX.

DISEASES OF THE URINARY ORGANS.

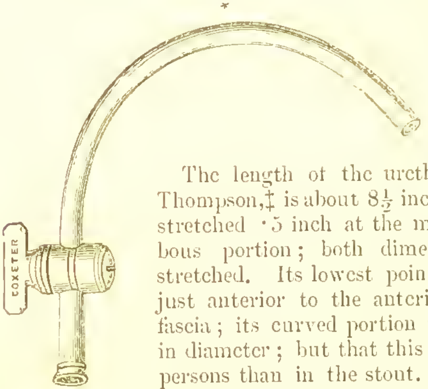
SECTION I.—RETENTION OF URINE FROM SPASMODIC STRICTURE.

I. Retention of Urine.—This term signifies want of power to pass the urine from the bladder. It therefore includes the idea that there is urine to pass; and must be carefully distinguished both in theory and in practice from the *suppression* of urine, in which no urine is passed because none is secreted.

II. The urethra is a canal surrounded by various structures, whose actions are capable of hindering the flow of urine through it. There is a layer of erectile tissue, which when turgid closes the canal; there is a layer of unstriped or organic muscular fibre; and, besides, at certain points there are voluntary muscles,—the muscles of Wilson and Guthrie, the levator ani, and accelerator urinæ.



The layer of organic muscle, the existence of which was inferred by Hunter, and demonstrated by Kölliker, has been more minutely investigated by Mr. Jabez Hogg and Mr. Hancock. According to the last-named gentlemen, it appears that the urethra is invested by a double layer of organic or unstriped muscular fibre; one layer immediately surrounding the canal, the other external to the prostate and the *corpus spongiosum* urethræ; which muscular coats are continuous with those of the bladder. Hence not only can the canal be closed by spasm of the voluntary fibres which are in relation with its membranous portion, but any part of the canal may be closed by the layer of involuntary fibres. Moreover, it is well to bear in mind that violent voluntary efforts, as in straining to empty the bladder, tend to close the urethra by the action of the levator ani.[†]



The length of the urethra, according to Mr. H. Thompson,[‡] is about 8½ inches; its circumference unstretched ·5 inch at the meatus, ·7 inch in the bulbous portion; both dimensions capable of being stretched. Its lowest point in the erect posture, is just anterior to the anterior layer of deep perinæal fascia; its curved portion ·3 of a circle 3·25 inches in diameter; but that this curve is sharper in thin persons than in the stout. In children, the greater elevation of the bladder in the pelvis produces a greater curve in the urethra.

Varieties.—Retention of urine may arise from causes functional or organic. The *functional* causes may be, 1, want of power in the muscular coat of bladder and urethra; 2, spasm of the urethra, mixed in some cases with some amount of inflammatory swelling. The *organic* causes include permanent stricture, that is to say, obstruction of the canal by organic disease and contraction;—cicatrices, the blocking up of the tube by stones or other foreign bodies coming down from the bladder, or introduced from without;—or by the presence of abscesses, or cancerous or other tumours;—or of fractured and displaced bones external to the urethra; or by disease of the prostate gland.

In the present section we shall speak of that form of retention of urine which arises from *spasm of the urethra.*

III. SPASMODIC STRICTURE generally affects persons who are already labouring under some slight degree of permanent stricture, or whose urethra has been rendered irritable by repeated attacks of gonorrhœa, or by a diseased condition of the urine; these, therefore, are the *predisposing causes.* The usual *exciting causes* are, exposure to cold and wet, and indulgence in liquor, which disorders the stomach, and

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[*] A very useful syphon, which can be fixed on to the end of the catheter, for the more convenient flow of the urine.

[†] Anatomy and Physiology of the Male Urethra, by Henry Hancock, F.R.C.S., Lond. 1852; Investigations of the Anatomy of the Urethra, &c., by Jabez Hogg, Pathological Trans., 1855.

[‡] Henry Thompson, F.R.C.S., &c., Pathology and Treatment of Stricture, being the Jacksonian Prize Essay, &c., Lond., 2nd ed., 1858. The cut shows a catheter, recommended by Mr. Thompson, and modelled according to the length and direction of the urethra. It is divided to suit the size of the page, and is exactly one-half of the real size. The axis of the point forms a little more than a right angle to that of the shaft.

renders the urine unusually irritating. Hence, an attack of spasmodic stricture generally comes on at night. It may also be caused by cantharides, whether taken by the mouth, or absorbed from blisters applied to the skin. Like irritation of the bladder, it may be a symptom of gout. It may likewise be caused by sexual excitement and by piles and other sources of irritation of the rectum or bowels.

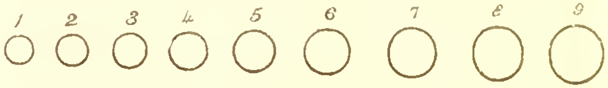
Symptoms.—The patient finds himself unable to pass his water, although he has a great desire, and makes repeated straining efforts to do so. The bladder soon becomes distended, and can be felt as a tense, round tumour above the pubes; and unless relief is given, the countenance becomes anxious, the pulse quick, and the skin hot. The straining efforts at micturition also become more frequent and violent, and the distress and restlessness are extreme. In this way the patient may, perhaps, go on for many days; a little urine passing occasionally when the spasm is less urgent, but the bladder still remaining loaded, till relieved by treatment. If not relieved, and if the urethra were previously diseased, either the bladder may burst into the peritonæum; or, as more frequently happens, the urethra behind the stricture (which, of course, becomes dilated and weakened under the pressure of the urine impelled by the whole force of the abdominal muscles) burst into the perinæum, and give rise to *extravasation of urine*, as will be described in the third section.

The *inflammatory stricture*, in which great pain and tenderness of the perinæum, and fever, are combined with spasm, is generally caused by abuse of injections, or by exposure and intemperance during acute gonorrhœa. The treatment of this and of the spasmodic variety must be the same.

Treatment.—The surgeon's proceedings must be regulated by the duration of the retention, and the amount of distension of the bladder, and by the previous history of the patient, as to the time during which the urinary organs have been diseased, and as to the exciting cause of the retention.

If the symptoms are not extreme, if they have been brought on by cold or conviviality, and there is no history of old stricture, a hot bath and dose of calomel, combined with a full dose of opium, and followed by castor-oil, or F. 38, will often relieve the patient. In cases in which there is no need of an aperient, a full dose of opium or Dover's powder, or an opiate enema or suppository, or a whiff of chloroform will suffice; for it is the great object to stop all violent voluntary efforts, and when they are discontinued the bladder will often empty itself easily. In inflammatory cases it may be requisite to leech or cup from the perinæum, or even to bleed, or give antimony; and large draughts of soda water, with a teaspoonful of the bicarbonate added, and other alkaline liquids, are also often of great service in cases of no great urgency, arising from errors in diet. The muriated tincture of iron, in doses of ♏x every ten minutes, is an empirical remedy, which the writer has often seen used. No one pretends to explain its *modus operandi;* and as it is seldom or ever given without the warm bath or other means, it is difficult to say what amount of benefit is really due to it.

But if these means do not succeed, a catheter must be introduced; or if the distension of the bladder be very great, it should be done at once, the patient being narcotized by chloroform. A silver catheter, of good size (8 or 9), may first be introduced. (This cut shows the sizes of catheters and bougies adopted by Savigny and by most other makers, No. 1 being ·125 and No. 9, ·25 inch in diameter.) The surgeon should well warm and oil it, and pass it through the palm of his hand, so that he may make sure that it is smooth and fit for use. The patient may either lie down flat, or stand with his back against a wall. The surgeon, holding the catheter in his right hand, raises the penis with his left, and introduces the instrument, with its concavity towards the left groin. Then he gradually raises it till it is perpendicular with the abdomen; and then the instrument ought to pass under the pubes into the bladder, whilst the handle comes down to a horizontal position. The instrument should be held lightly, and let make its own way, so to say, along the passage. The surgeon, if necessary, should draw the penis well forwards on it, so as to stretch the urethra, and prevent the instrument from becoming entangled. He should make the point slide along the upper rather than the lower surface of the urethra. On meeting with an obstruction, he should press against it steadily, but very gently; and by delicate manipulation for five or ten minutes, the stricture will in most cases be made to yield. The oiled forefinger of the left hand introduced into the rectum is a most useful help.



If the silver catheter does not pass, the surgeon may try a gum catheter that has been kept for some time on a wire, so that it keeps its curve when the wire is drawn out.

Instead of oiling the catheter, Mr. H. Thompson carefully fills the urethra with pure olive oil by means of a glass syringe, forcing it down to and through the stricture, and retaining it by the finger and thumb at the orifice till the catheter is introduced. Mr. Thompson says that the instrument passes with less pain by this means.[*]

Whenever spasmodic stricture occurs frequently or periodically, the surgeon should examine most carefully into those conditions of the health generally, and of the urine particularly, which give rise to it: and should resort to the catheter as sparingly as possible, unless there is some organic stricture requiring it. When there is great depression or debility, tonics; when periodicity of attack, quina; when an overloaded state of the bowels, aperients; and, when the urine is irritating.

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[*] On Stricture, p. 179, 2nd ed.

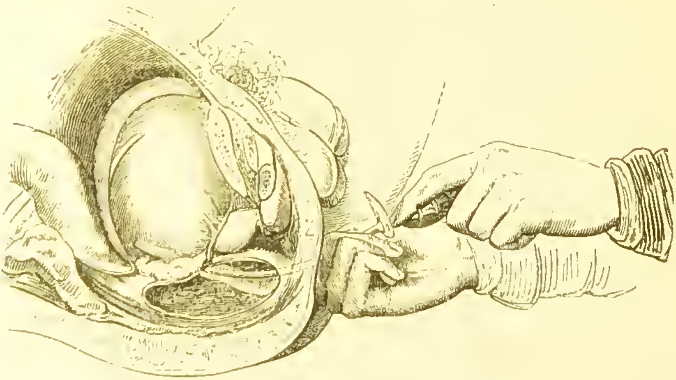
the measures detailed in the eighth section of this chapter should be resorted to.

Puncture of the bladder.—If none of these means succeed, and the bladder has become exceedingly distended, an operation will be necessary to relieve it, and save the patient's life. Although, we must observe, that this is never necessary from mere spasm, unless there is also extensive and old-standing disease of the urethra or prostate. The time at which it must be done must be decided by the surgeon's judgment; sometimes, as Sir B. Brodie observes, it is necessary within thirty-six hours, sometimes not for three or four days. The operations may be—

1. *Forcing a passage;* that is to say, pushing the catheter onwards through the obstruction into the bladder, as nearly as possible in the course of the natural passage. This is not applicable to stricture; but to cases in which the obstruction is in the prostate, and should only be attempted by one who is an expert manipulator, and thoroughly acquainted with anatomy.

2. *Incision of the urethra in the perinæum*, with or without division of the stricture. This, with the cases to which it is applicable, is described in the next section.

3. *Puncture of the bladder by the rectum* is performed by placing the patient on his hands and knees, or placing him on his back with his knees drawn up, and bringing him close to the edge of the bed, introducing the right forefinger into the anus, and a long curved trocar and canula by its side, then feeling for, and making sure of, the distended bladder just behind the prostate, and exactly in the middle line, and plunging the trocar into it—leaving the canula for four-and-twenty hours. The rectum should be first of all cleared by enema. The point of the trocar should be withdrawn slightly within the canula as it is being introduced into the anus, so that it may do no mischief.



This operation has been strongly recommended by Mr. Cock,* who has had great experience of its utility.

4. *Puncture of the bladder above the pubes.*—This is performed by making a small incision through the linea alba just above the pubes, and then thrusting a long trocar and canula downwards and backwards into the bladder, where it is not covered by the peritonæum. The canula must be retained, and the patient be kept on his back to prevent extravasation; and no time should be lost in restoring the natural passage.

SECTION II.—PERMANENT STRICTURE.

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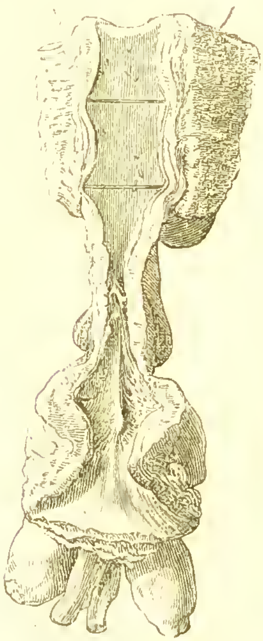

Permanent Stricture signifies a contraction of the urethra, caused usually by inflammation, infiltration of plastic material, and subsequent shrinking of this material and of the canal, and gristly degeneration of the tissues around the canal. But Mr. Hancock has found, contrary to the general opinion, that lymph may be effused on the free surface of the mucous membrane, and then be developed into imperfect fibrous tissue, partially blocking up the canal. In some cases a small portion of the mucous membrane, perhaps only a line or two in extent, is found thickened and deprived of its natural elasticity; or perhaps contracted so as to form a sharp fold, as if it had been tied with a thread. But in old neglected cases, the canal with the *corpus spongiosum* around may be converted into a thick, gristly, cartilaginous mass several inches in extent. The most frequent *situation* of stricture is "in the substance of the bulbous portion of the canal, or a little anterior to it."†

The *causes* are repeated gonorrhœa, intemperance, and unhealthy conditions of the urine.

Symptoms.—In what may be called the *first stage*, the patient finds that he wants to make water oftener than usual, and that he has more or less uneasy sensation in the perinæum after doing so; he also notices that a few drops hang in the urethra, and dribble from him after he has buttoned up. Then he observes that the stream of water is smaller than usual, and forked, or scattered, or twisted, and that he requires a longer time and greater effort than usual to pass it. Itching of the end of the penis and gleety discharge are frequent concomitants.

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* Cock, Med. Chir. Trans., vol. xxxv.

† This drawing, from a preparation in the King's College Museum, shows the urethra laid open, and a stricture in the membranous portion just in front of the verumontanum.

‡ Henry Smith, F.R.C.S., quoted in Ranking, vol. x., 1849, with an account of examination of ninety-eight specimens. See the same author's work on Stric-

If the disease proceeds to its *second stage*, the bladder becomes irritable, obliging the patient to rise in the night to void his urine. He is liable to attacks of spasms with complete retention, as was described in the preceding section. In one of these, the urethra may ulcerate or burst, giving rise to urinary abscess, or to extravasation of urine, as will be described in the next section. Rigors occurring in paroxysms like ague fits are not uncommon. (See Section VII.)

Finally, if the complaint is permitted to continue, the health suffers from the constant irritation and want of sleep; the bladder and kidneys become diseased; the complexion becomes wan; the appetite fails; the patient complains of chills and flushes, of aching and weakness in the back, and of great languor and depression of spirits; and the urine is constantly loaded with fetid mucus. After death, the urethra behind the stricture is found greatly dilated; the prostate, with its ducts dilated, and in a state of suppuration, or perhaps containing small circumscribed abscesses; the bladder sometimes dilated, but more frequently contracted, and enormously thickened; sometimes sacculated from a protrusion of its mucous coat between the fibres of the muscular; the ureters dilated, and converted into subsidiary receptacles for the urine, and the kidneys either greatly dilated or disorganized. An engraving illustrative of this will be found in the seventh section of the present chapter.

Treatment.—The remedies for stricture are twofold. The first, which should always receive the earliest and greatest attention, are such as tend to remove any disorder of the stomach, or of the general health, and any irritating quality of the urine, or inflammatory tendency about the parts concerned. It must be recollected, especially with people of education, that the *mind* has an important share in producing the *subjective* symptoms of stricture; and that gout will often produce pain and spasm in the perinæum, which can be charmed away

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ture, Lond. 1857, p. 29; Mr. Henry Thompson (op. cit., 2nd ed., p. 83) divides the urethra into three regions; and finds that out of two hundred and seventy specimens, two hundred and fifteen, or sixty-seven per cent., are situated in the first region; which comprises an inch of the canal before, and three-quarters of an inch behind, the junction between the spongy and membranous portions of the urethra. "That part of the urethra," says Mr. Thompson, "which is most frequently affected with stricture, is the portion comprised in the inch anterior to the junction; that is, the posterior or bulbous part of the spongy portion." The second region, comprising two and a half or three inches in front of the first, was the seat of fifty-one strictures, or sixteen per cent.; and the third region, consisting of the anterior two and a half inches, fifty-four, or seventeen per cent.

by an alkaline purgative and colchicum; further, that every irritated and infiltrated tissue has a natural tendency to recovery, when the exciting causes are removed. If sexual indulgence, drink, dissipation, and gonorrhœa will produce chronic inflammation and tendency to stricture, it is equally true that chastity, temperance, rest, early hours, warm baths, purgatives, and alkaline remedies may undo the mischief. Hence it is a coarse and violent proceeding to introduce instruments into the urethra of a young man without pressing necessity, until a course of proper treatment has failed; and it may be a mortiferous proceeding in the case of an old man. Shiverings, fever, suppression of urine, and death may follow.

In every case then, admitting of delay, the surgeon should begin by calculating how much of the malady is removable by regimen and medicine, and should remove that first. Warm baths; opiate suppositories; belladonna smeared in the perinæum; and alkalis after meals may be of service. F. 38, 72, 77, 78, 79, 149, 181. (See *Gleet*, *Chronic Inflammation of the Bladder*, and *Urinary Deposits*.)

Then will be the time for the second class of remedies, consisting of *mechanical means*, such as 1. Dilatation by a bougie or sound: 2. Dilatation by means of expanding instruments: 3. By a catheter retained: 4. By the caustic bougie: 5. By incision from within: 6. By division from the perinæum. These we proceed to discuss in succession.

1. *The Bougie.*—The common bougie is, as its name implies, a wax candle, or cylindrical body composed of linen imbued with wax or plaster. It is flexible, becomes softened by heat, and is supposed to be capable of doing less harm than a metallic instrument, if mismanaged. Similar instruments (less safe) are made of gutta-percha and caoutchouc. But, as has been well said by Mr. H. Thompson, the surgeon who knows what he is about will prefer to have an instrument that will obey his hand, and which is adapted to the normal direction of the passage. He will, therefore, prefer a metallic sound. But if the instrument is to be introduced by the patient himself, it may be flexible; and if the canal is tortuous from disease, and the natural direction lost, and the unnatural direction difficult to find, it may be convenient for the surgeon to use a flexible instrument, in the hope that it may find its own way into the bladder.

In the first place the surgeon desires to ascertain whether there is a stricture, and if so, where. For this purpose he takes a full-sized sound, *i. e.*, one that will enter the orifice easily, and fill it; and having warmed, oiled, and passed it through his hand to make sure of its polish, he introduces it in the manner directed for the introduction of a catheter. If it seems to meet with an obstruction, it should be drawn a little backwards, then most gently pressed onwards, to see if it will enter, and be grasped by it. If not, it may be exchanged for a smaller one, and gentle persevering trials be made—not too much at one time—to get the instrument fairly into the stricture. The surgeon should allow it to remain in for five or six minutes, by which time probably the patient will complain of sickness or faintness ; and when he withdraws it, should make a note of the size. After three or more days—more or less according to the pain and irritation caused—the process may be repeated ; and it must be gone on with at the same interval, with a gradual increase of the size of the instrument, till the canal is restored to its natural calibre. For some months afterwards it is expedient to pass a sound about once a fortnight. Chloroform may be given if there is great pain or difficulty.

Metallic bougies, or *sounds* made of silver, or steel plated, are always to be preferred to those of soft materials, 1st, if the stricture is old and very hard and gristly ; 2ndly, in cases of very irritable urethræ, because their smooth polished surface is not so apt to cause spasm ; 3rdly, in cases where a false passage has been formed, which these instruments, as they can be directed with greater precision, can be better made to avoid. They should be eight or nine inches long, not smaller than No. 4, their curved part need not be so long as that of a catheter, and they should be mounted on a firm wooden handle, and their point should be made to slide along the upper surface of the urethra, as it is at the bottom that false passages generally exist, and are most easily made.

These instruments may also be used for the cure of old *impassable* strictures in the following way :—A sound of moderate size, about one-fifth or one-sixth of an inch in diameter, may be introduced once in three or four days, and be firmly pressed against the stricture for from five to fifteen minutes, taking care to keep its point against the upper part of the urethra. This will cause the anterior part of the stricture to relax a little ; and if the process is repeated often enough it will at last clear the way to the bladder. Or a sound with a conical point may be introduced into the anterior part of the stricture, and kept there for an hour or two at a time. This is often called the cure by *vital dilatation*.*

The *plaster bougie*, if used, must be slightly bent, and oiled. If its passage is resisted, gentle pressure may be tried, to see if it will enter the stricture. If it seems to pass, the operator should let go for a moment to see if it recoils ; for it must be remarked that it may *bend*

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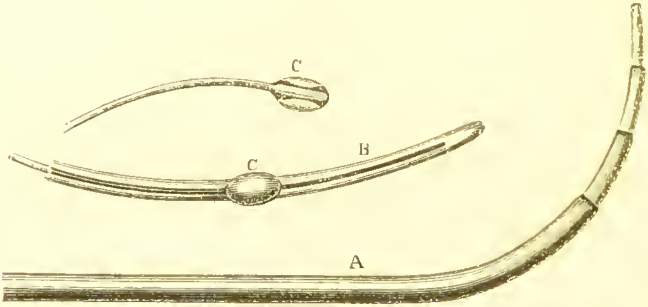
* Vide Sir B. Brodie on the Urinary Organs, 3rd edit., 1842. Guthrie on the Urinary Organs, Lond. 1843.

† Sound with bulbous point. Natural size.

against the stricture without entering it, and may thus lacerate the canal.

If there is more than one stricture, an instrument with a bulbous point may be of use, because it will not be grasped by the first stricture after the bulb has passed.

2. *Urethra Dilators.*—The good effects of the bougie are owing to the stimulus of gentle pressure. But, in order to accelerate the cure, various plans have been proposed for effecting actual dilatation of the stricture. First may be mentioned the *compound circular catheter*, used by Dr. Andrew Buchanan of Glasgow, in 1831, and described in the Med. Gaz. for March 1841. It consists of three or more graduated silver tubes sliding one over the other, and the smallest sliding over a round-pointed probe. The external tubes acting as guides enable the inner ones readily to pass the strictured part, and when once a smaller tube has passed, it is safe and easy to slide in the others. In guiding this instrument along the membranous and prostatic portion, Dr. Buchanan retains his finger in the rectum. (*See* Figure A.)



Dr. Sheppard, of Stonehouse, uses a very small catheter, B, grooved on one side: along this a metallic button, or *traveller*, C, can be pushed by means of a fine wire which lies in the groove. The travellers are of various sizes. The instrument is made by Weiss.

Mr. T. Wakley's instruments (see p. 565).—They consist of, firstly, a very small catheter, A, which is to be passed through the stricture into the bladder. Secondly, a slender steel rod, B, which is next to be passed within the catheter and screwed into it. This rod and the catheter thus united form a *directing-rod*, over which other instruments are to be passed. Thirdly, there is a series of straight silver tubes, C, of graduated sizes; the smallest just one size larger than the directing-rod; the largest equal to a No. 10 bougie. Each of these tubes is constructed so as to glide accurately over the directing-rod; and thus, the latter being in the urethra, any stricture can be dilated to as great an extent as the surgeon thinks prudent at one sitting. Of course the size of our page prevents the artist from showing more than two ends of these instruments; the middle will readily be imagined by the reader.

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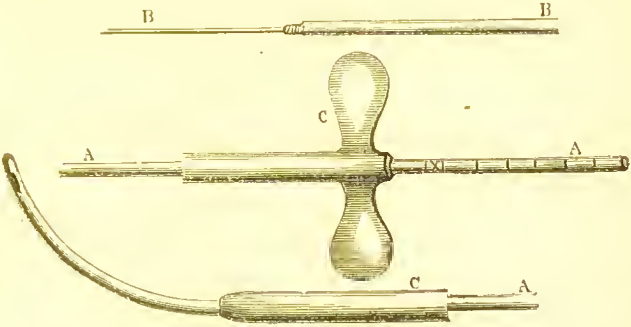

In the next place, *Mr. Holt's improvement of M. Perreve's instrument*, may be mentioned. It consists of a staff, formed of two blades, A and B, joined at the smaller extremity, C, and capable of diverging

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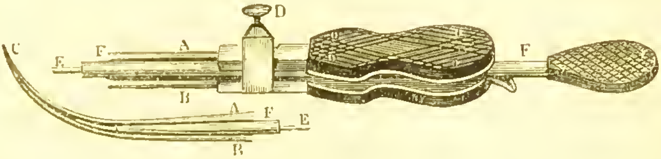
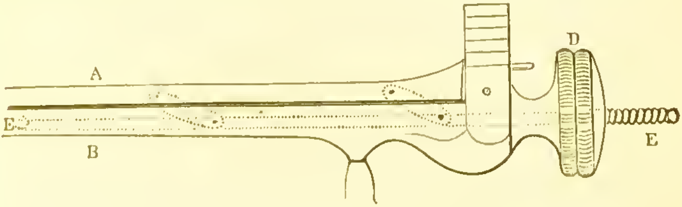


by means of a screw, D, at the handle. Between them is a directing-rod, E, and on this directing-rod, under cover of and between the two separate blades, a dilating-tube, F, can be passed down to and within the stricture after the staff in its undilated state has been passed.



Mr. Coxeter has an instrument consisting, like the foregoing, of two blades, joined at the smaller extremity. The upper blade, A, is connected with a rod, E, which works within the lower blade, B, by several small bars riveted at each end, whose action is like those in the well-known instrument called the parallel ruler. By turning the nut D, the rod, E, which ends in the screw, F, is pushed forwards; thus the connecting bars cause the upper blade, A, to separate from the lower.

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* Mr. Wakley's Dilator. See Lancet for 1851, vol. i., p. 122.

† Mr. Holt's Stricture Dilator. See Barnard Holt on the Stricture Dilator, Lond. 1852.

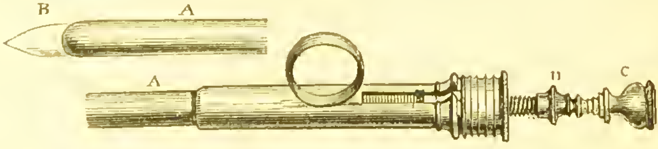
Numerous other modes of dilating strictures are in existence, or may be invented by any man of ingenuity. But in these, as in other cases, whether the surgeon may venture to effect speedy dilatation, or whether he must be content to do but little at a time, is a question which he must decide from his knowledge of the patient's constitution. Rigors, abscess, and pyæmia may result from indiscretion.

3. If a *small catheter is retained in the bladder* for two or three days, the passage suppurates and dilates remarkably; just as the lachrymal duct does from the presence of a style. This method of cure may be attempted when the stricture is very gristly and cartilaginous; when the urethra is irregular, or has had a false passage made in it; or when the urethra is so irritable that severe rigors and fever are occasioned by the passage of the urine after the use of the common bougie—a circumstance common enough with patients whose kidneys are unsound. The catheter should be of silver, and should be retained by means of two strings, which may be passed backwards between the thighs, and be fastened to a band round the waist. It should be removed in two or three days, and a larger catheter should be passed four-and-twenty hours afterwards, and should be introduced often enough subsequently to keep up the dilatation. But the continued presence of the catheter is liable to cause so great an amount of irritation that it cannot always be borne, even with the aid of opium.

4. The *caustic bougie* is a most powerful agent in deadening the sensibility of very irritable stricture, but is liable, if mismanaged, to produce inflammation, retention of urine, hæmorrhage, abscess, and any other conceivable mischief. Two kinds of caustic are used; the nitrate of silver and the caustic potass. The caustic potass is much used by Mr. Wade, who speaks highly of its effects: 1st, in hard cartilaginous strictures through which no instrument can be passed without injurious force; 2nd, in hard strictures of long standing, which, though admitting the passage of a small bougie, bleed freely on its introduction; 3rdly, in irritable strictures; 4thly, in spasmodic strictures when not arising from acute inflammation; 5thly, in strictures which have a marked tendency to contraction, after having been dilated by the common bougie. The manner of using it is the following:—"A small piece of potassa fusa," says Mr. Wade, "should be inserted into a hole made in the point of a soft bougie. The eighth part of a grain is the smallest, and a grain the largest quantity of the potass I am in the habit of using, but it will rarely be necessary to exceed the sixth of a grain. The bougie should be well moulded round the potassa fusa, so as to prevent the alkali from pro-

jecting, and it should be so placed that it may be more applied to the upper than the lower part of the stricture. From three to four are the sizes of the bougies I generally employ, but to such as are pervious they should be used of a size or two larger than the obstruction, which the point of the instrument should penetrate. The armed bougie should be passed rapidly down to the stricture, and be held against it, with gentle but steadily-continued pressure, for one, two, or three minutes, according to the nature of the obstruction, for if it is very irritable and bleed readily, the caustic should be used for the shortest time on the first trial." Slight heat, and slight muco-purulent discharge, perhaps tinged with blood, are the effects which the patient is to expect; but they soon pass off, and it is alleged that it is an alterative and absorbefacient effect, not a mechanical destruction, which is to be wrought on the stricture. The caustic bougie may be used once in from three to five days, but never till the irritation caused by a previous employment of it has quite subsided.* The *nitrate of silver* may also be used by means of a small fragment inserted into the end of a bougie. There are, besides, instruments, used more especially for cauterizing the prostatic portion, such as the *porte caustique* of Lallemand; in which a stilette coated with the solid nitrate can be protruded: there is an instrument used by Henry Smith and others, in which the stilette is covered with sponge, dipped in a solution of the lunar caustic;—and, still better, a catheter, devised by Mr. Erichsen, for injecting a few drops of caustic solution into any part of the urethra that it may be desired to operate on.

5. *Puncturation*, or division of the stricture by means of the *lanceted stilette*,† invented by Mr. Stafford, or of Mr. Fergusson's *urethrotome*, may be resorted to in some cases of old stricture of small extent, at the anterior part of the urethra, which resist dilatation. The lanceted stilette consists of a tube, A, straight or curved, which is pushed down to the stricture, and from which a lancet, B, can be made to protrude by pressure on the head, C, so as to divide the contracted texture. The screw D regulates the extent to which the lancet protrudes; and a spring within the larger extremity of the instrument provides for the return of the lancet within its sheath. Mr. Fergusson's urethrotome



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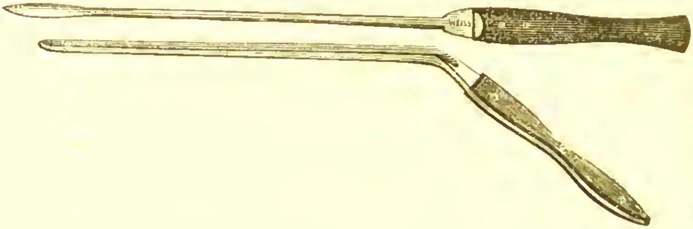
* Robert Wade on Stricture of the Urethra, 2nd edit., Lond. 1849. See also H. Smith on Stricture, p. 121. The observations in H. Thompson on Stricture, 2nd ed., p. 229, on the measured and observed effect of minute fractional parts of a grain of the potass, are well worth reading.

† Stafford on Stricture, Lond. 1829. Fergusson, Pract. Surg., 3rd edit., p. 190.

consists of a very long director, under cover of which a very narrow blade can be introduced.

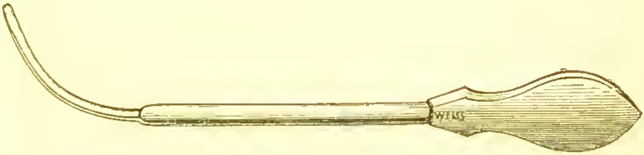


Another instrument consists of a sound of ordinary dimensions, ending in a narrow director. The latter is passed through the stricture, and then a lancet-blade can be thrust forwards, along a slit running through the length of the director. Thus the lancet cannot get out of the proper channel. Many other forms there are, some intended to divide the stricture from behind forwards, as the instrument is being withdrawn, and these last are the safest.

6. The operation of OPENING THE URETHRA FROM THE PERINÆUM is absolutely requisite in all cases of rupture of the urethra with extravasation of urine, and in cases of stricture complicated with abscesses or false passage when no instrument can be passed; and it is expedient in cases of very old stricture with extensive urinary fistulæ, when the health is giving way, and other means fail of affording relief. It is performed thus:—the patient is placed in the lithotomy position; a grooved staff is passed through the stricture if possible. If this be not possible, it must be passed down to it. The left forefinger, introduced into the rectum, is to feel for the staff in the urethra, and serve as a guide to the incisions. Then a straight bistoury is to be plunged in just above the anus to the depth of an inch, with its edge upwards, and made to cut its way out upwards in the middle line of the perinæum. The end of the sound should next be felt for and cut upon, and the knife is then to be carried backwards through the stricture into the urethra beyond it, which is always more or less dilated and prominent, especially if the patient is told to strain and try to pass urine. The stricture should be thoroughly divided, and all sinuses laid open. A catheter should then be passed into the bladder, and be retained there for twenty-four or forty-eight hours.

If the operator desires merely to relieve the bladder, and does not think it prudent, from the patient's condition, to make the more extensive incisions through the stricture which we have just described, he may, after the first incision, keeping the back of the knife to the rectum, cut into the membranous part of the urethra behind the stricture, and so get a female catheter into the bladder, reserving the stricture for future treatment.

7. *Perinæal Section.*—Professor Syme has recommended this operation, not merely for cases in which incision is commonly considered necessary, that is, for cases of impervious and complicated stricture; but for others, in which, *although an instrument can be passed*, the stricture is excessively irritable, and resists the common treatment by dilatation, or contracts again perpetually, and is wearing out the patient's health by pain, rigors, and other signs of irritation, and in which the patient's state of health is such as to render an operation on these parts safe, and the residue of his life worth enjoying. The patient having been put under the influence of chloroform, and held in the lithotomy position at the edge of a bed, "a grooved director slightly curved, and small enough to pass readily through the stricture, is introduced and confided to one of the assistants. The surgeon, sitting or kneeling on one knee, now makes an incision in the middle line of the perinæum or penis, wherever the stricture is seated."* It should be about an inch and a half long, and extend through the skin and textures external to the urethra. The operator then taking the handle of the director in his left, and the knife, which should be a small straight bistoury, in his right hand, feels, with his forefinger guarding the blade, for the director, pushes the point into the groove behind the stricture, and runs the knife forward so as to divide the *whole* of the thickened texture at the contracted part of the canal. A full-sized catheter should be retained for twenty-four hours afterwards. The cases in which this operation is allowable are specified above. The amount of fatality attending it must be difficult to be estimated precisely: it will be less in private than in hospital practice, and in proportion as the patients are free from renal disease. Out of 219 cases collected by Mr. Thompson, only 15 deaths occurred within two or three months of the operation, and of these, 9 were hospital cases, which proved fatal by pyæmia. This is the greatest danger: hæmorrhage seems not to be so great a source of risk.†



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* On Stricture of the Urethra, by James Syme, F.R.S.E., Edin., 1849.

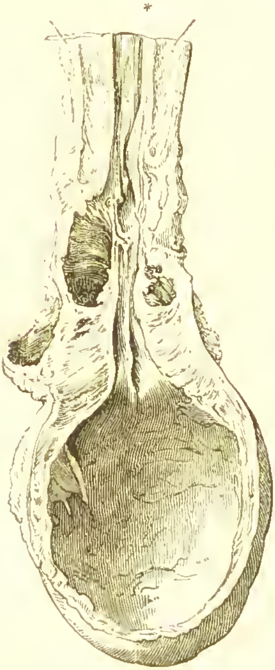
† See the very fair and impartial summary of the value of this operation in Mr. H. Smith's work on Stricture, p. 252; also in Mr. Thompson's work, p. 302.

8. Lastly, supposing a case of old complicated gristly stricture, with complete retention from inflammation or spasm, the surgeon must estimate whether it might not be safer on the whole to puncture the bladder by the rectum, and so to give a period of tranquillity to the diseased parts, than to run the risk of a large wound in imperfectly-vitalized tissues, in a constitution, perhaps, already almost worn out.

In whatever manner a stricture has been cured, the bougie should still be used at intervals, to prevent a fresh contraction.

SECTION III.—URINARY ABSCESS, EXTRAVASATION OF URINE, AND FISTULA IN PERINÆO.

I. URINARY ABSCESS is a frequent consequence of stricture. Either an abscess forms in the cellular tissue close to the urethra, and after a time opens into that canal; or, perhaps, one or two drops of urine escape into the cellular tissue, in consequence of ulceration of the urethra behind the stricture; and this small quantity of urine produces inflammation, so that an abscess forms, filled with dark-coloured putrid pus. In the same manner, a little urine may escape from a minute aperture in the bladder, and give rise to abscess behind the pubes, or between the bladder and rectum; which may point above the pubes; or in the groins, or may burrow amongst the muscles of the thigh.



Symptoms.—A patient with old stricture complains of rather more difficulty of micturition than usual, and of some amount of obscure swelling of the scrotum or perinæum, of an œdematous kind. There may be little or no pain, and little inflammation for the first twenty-four hours; after this the swelling increases; if in the scrotum rapidly; if in the perinæum it will be deep, hard, and painful, but not prominent. Shivering, hot skin, and dry tongue follow.

Treatment.—The abscess should be opened immediately, and the patient may soon be brought from the gates of death to comparative health. It will also be expedient to cut through the stricture as directed in the last section, and pass a catheter into the bladder.

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* This cut exhibits the urethra laid open; a stricture at the commencement of the bulbous portion; and false passages, one of which leads into an abscess that surrounds the membranous portion.

II. RUPTURE OF THE URETHRA and EXTRAVASATION OF URINE.—This is another consequence of old stricture, and it generally happens in the following way:—A patient, who has long been labouring under difficulty of micturition, has a fit of spasmodic retention more obstinate than usual. He is repeatedly getting out of bed, and straining with all his might to pass his water. At last, during one violent effort, he plainly feels that something has given way; his painful sense of distension becomes immediately less, and he is very well pleased, and thinks himself better. And perhaps he is now able to make a little water by the natural passage, because the stricture generally relaxes, when, by any means whatever, it is relieved from the former pressure. But at the time when something seemed to yield, the urethra burst; the urine was forced by the whole power of the abdominal muscles into the cellular tissue of the scrotum, perinæum, and groins; the patient soon complains of a smarting or tingling about the anus and perinæum; the urine, which has become putrid and concentrated by long confinement in the bladder, speedily causes inflammation and sloughing; the skin over the infiltrated parts displays a reddish blush, which is soon succeeded by black spots of gangrene; low typhoid symptoms appear; the tongue is black, the pulse begins to falter, the skin is clammy; low muttering delirium and hiccup come on; and the patient soon departs this life, unless proper measures are taken for his relief. A black spot on the glans penis, indicating that the urine has penetrated the corpus spongiosum, is a very fatal sign.

Treatment.—A staff or catheter must be passed as far as possible, and it may sometimes be passed quite into the bladder, because, as was observed above, the stricture generally relaxes after the bladder is unloaded, be it how it may: the perinæum must be incised in the middle line, and at the same time free incisions must be made into any parts that are swelled or emphysematous, showing that they have been pervaded by the urine. The first points necessary for the patient's safety, viz., the relief of the bladder, and the escape of putrid pus and urine being thus provided for, the surgeon must use his own discretion as to meddling with the strictured part then, or reserving it till the patient has rallied a little.

The urethra may also be ruptured by blows or kicks on the perinæum, or by accidents that fracture the bones of the pelvis. The symptoms will be pretty evident. The patient will be unable to make water; or if he attempts it, the urine will be extravasated into the perinæum and scrotum. There will also be bleeding. The treatment consists in introducing a full-sized catheter into the bladder, and retaining it for twenty-four hours; and in incising the perinæum if urine has been extravasated.

III. FISTULA IN PERINÆO, or *Urinary Fistula*, signifies an opening from the perinæum into the urethra, through which the urine dribbles when the patient makes water. It is a frequent consequence of urinary abscess and extravasation.

Treatment.—The first and most essential measure is, to restore the urethra to a healthy state, and to dilate any strictures that may happen to exist, by the bougie. When this has been done, the fistula should be stimulated to granulate by injections of arg. nit., or by passing a heated wire into it; and the external orifice should be occasionally touched with potass, so as not to allow it to heal before the whole track is closed—otherwise fresh abscesses will form. In extreme cases the urethra must be laid open, as before directed. For loss of substance, an incision may be made on either side, and the vivified edges be brought together by suture.

Sometimes there is a *blind* fistula in perinæo; that is, a small narrow fistula, opening into the urethra, but not externally. It is occasionally inflamed and tender; and may be felt as a small tumour in the perinæum; perhaps the size of a horse-bean. It is attended with more or less discharge from the urethra. The treatment consists in laying the tumour open, and dilating any strictures that exist.

Sometimes a fistulous communication forms between the urethra and rectum. This may be known by air passing through the urethra. It is to be treated by dilating the urethra, so that the urine may pass freely; and then a heated wire may be introduced into the fistula from the rectum, in order to close it by the adhesive inflammation.

SECTION IV.—OF SOME OTHER AFFECTIONS OF THE MALE URETHRA.

I. Contraction of the Urethra following injuries, such as blows on the perinæum, must be treated in the same way as permanent stricture.

II. Contraction of the Orifice of the urethra may be a congenital affection, or may be caused by the cicatrization of ulcers. It must be counteracted by the daily passage of a short bougie, otherwise it may produce all the evil consequences of stricture further back. If the contraction is very great, and causes retention of urine, one of Anel's probes, a common probe, and a director may be introduced in succession, and then, when the bladder is emptied, the orifice must be dilated by a slight incision downwards.

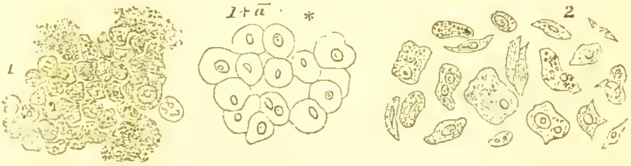
III. False Passage.—This may be produced by using too small a sound, and pushing it out of the urethra, or by the misuse of caustic bougies. There is nothing to be done for the false passage; but the stricture, which was the origin of it, must be treated either with the metallic sound, or by keeping in a small catheter. When the surgeon suspects that he has pushed an instrument out of the right passage, he ought to leave the urethra untouched for at least a week.

IV. Hæmorrhage from the Urethra may be caused by the rude introduction of bougies, or by injuries from without, or by the separation of a slough formed by the caustic bougie; or, lastly, by a rupture of blood-vessels during acute chordee. If the application of cold does not check it, pressure may be tried. A flat piece of cork should be pressed by the patient against the perinæum far back, and be gradually moved forward, till it lights on the right spot, and the dripping of blood ceases. Gallic acid may be of service.

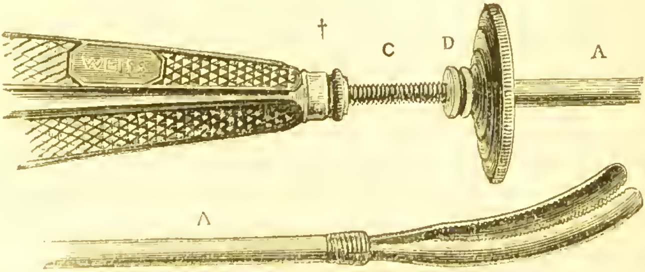
V. Solid Tumours in the course of the urethra, composed of indurated follicles, torment the patient by keeping up a perpetual gleet and chordee. The mercurial ointment with camphor externally; and the passing of a bougie; or keeping a small catheter in the bladder for a few days at a time—are the chief remedies.

VI. Tumours within the Urethra, formerly called *Caruncles*, consist either of vascular excrescences near the orifice, which may be snipped off or cauterized; or of small polypi growing from the prostatic or membranous portion. Both are rare.

VII. Acute and Chronic Inflammation of the mucous lining of the urethra, from whatever cause arising, present the symptoms, and consequences, and require the treatment of the gonorrhœa and gleet which arise from contagion. The author has found mere epithelium in discharges from the male urethra, which yet caused great irritation to the female after connexion.



VIII. Foreign Bodies in the urethra may consist of calculi, pieces of bougies, straws, slate pencil, or of other bodies introduced from without; of clots of blood, of mucus, or, in rare cases, of portions of fæcal matter, or worms that have passed into the bladder from the



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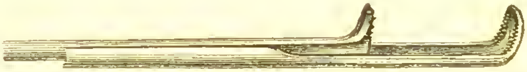
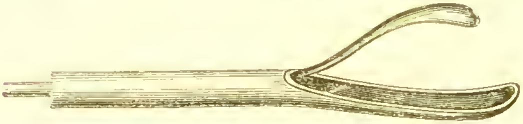
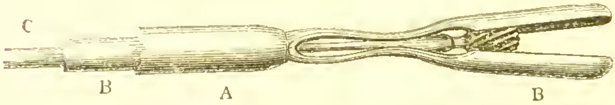
[*] 1. Discharge from gonorrhœa, all but cured. $1+a$. The same, with acetic acid. 2. Discharge in a case of obstinate non-venereal gleet.

[†] This instrument consists of two blades, capable of being expanded by being pushed through the canula A, and of being closed if the canula is pushed forwards above them; D, a screw, regulates the distance to which they can be expanded.

intestines by means of an ulcerated opening. They may perhaps be pushed forwards by the fingers, aided by the patient's strainings,—and then may be brought out through the orifice (which must be slightly dilated if necessary) by forceps, or a bent probe. Many instruments have been invented for this purpose, and especially by lithotritists. The urethral forceps of Weiss; the instrument consisting of two blades B, passing through a canula A, and having a central file C, for pulverizing any substance that admits of it;—and the scoop with a tongue are the most useful. A loop of fine wire, and a pair of very fine dissecting forceps may also be found useful. During the necessary manipulations a finger or thumb should be pressed on the urethra behind the foreign body—through the rectum if needful—in order to prevent it from slipping backwards into the bladder. With this precaution it may answer to inject a good stream of water from a large syringe, so as to dilate the passage. But if these means fail, the substance must be pushed back into the membranous portion (if not there already), and be extracted by an incision in the perinæum. Incisions into the front of the urethra should be avoided, for they are apt to leave irremediable fistulæ; or, if near the scrotum, may occasion infiltration of urine into its loose areolar tissue.







SECTION V.—DISEASES OF THE PROSTATE.*

I. ACUTE INFLAMMATION of the prostate is generally a consequence of acute gonorrhœa, but may be caused by stricture, calculus, or any other source of irritation. The *symptoms* are, great weight, pain, and throbbing at the neck of the bladder, and tenderness of the perinæum; the gland feels swelled and tender on examination by the rectum, and there are frequent, violent, and exceedingly painful efforts to make water: as the disease subsides, a greyish viscid muco-purulent matter is voided with the urine.

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* For the latest and best account of the structure and diseases of the prostate, see Henry Thompson on the Enlarged Prostate and Stone in the Bladder, Lond. 1858; also Med. Chir. Trans., vol. xl.; Ellis, ib., vol., xxxix.; also Coulson on Diseases of the Bladder and Prostate Gland, 4th edit., Lond., 1852, p. 421. Adams on the Prostate Gland.

Treatment.—Rest in bed, cupping or leeches to the perinæum, or general bleeding if the patient is strong, hot baths, poultices, and fomentations: and enemata of starch ℥ii, laudanum ʒss every night. If the urine cannot be passed without it, a very small gum catheter may be introduced; but it should be avoided if possible.

II. CHRONIC INFLAMMATION, with enlargement from interstitial deposit, may be a sequel of the acute; and should be treated by baths, small doses of mercury, alkalis, and iodide of potassium.

III. ABSCESS of the prostate is an occasional, though rare, consequence of tubercular deposit in scrofulous subjects. It is more commonly an acute affection, and may be suspected if rigors, and obscure swelling in the perinæum, follow the symptoms of acute inflammation. In any such case, the swelling should at once be freely punctured with a bistoury. If left to itself, the abscess may burst into the rectum or the urethra, which latter circumstance will be indicated by a sudden discharge of pus with the urine, and a stinging pain accompanying the discharge of the last few drops. Perhaps there may be hæmorrhage. If the case is chronic and the habit scrofulous, quinine and tonics, and small doses of cubebs, to act as a gentle stimulus on the parts, will be of service.

IV. CHRONIC ENLARGEMENT, or HYPERTROPHY.—"The prostate," says Mr. Ellis, "is essentially a muscular body, consisting of circular or orbicular involuntary fibres, with one large central hole from the passage of the urethra, and another smaller oblique opening, directed upwards below the former for the transmission of the common ejaculatory seminal ducts to the central urinary canal. . . . Its circular fibres are directly continuous behind, without any separation, with the circular fibres of the bladder." The prostate is thus essentially a circular involuntary sphincter to the neck of the bladder, and expeller of the seminal fluid; but although it contains many mucous glands and follicles, intermixed with the muscular fibres, it is by no means entitled to the name *gland*. It contains, further, a small vesicle or utricle, at the mouth of which the ejaculatory ducts open, and which is believed to be the male homologue of the female uterus.

The affection we now treat of is peculiar to advanced life, and consists in an hypertrophy or enlargement of the natural muscular structure, and incidentally of the glandular. "In youth," says Mr. Thompson, "the organ becomes enlarged by interstitial plastic effusion, the result of inflammatory action. In age there is an unnatural development of the prostatic tissue itself."

The increase may be but slightly above the ordinary chesnut size of the gland, or it may render it as large as a man's fist, or larger. It may affect the whole organ, especially the lateral lobes, pretty uniformly; in which case the prostatic portion of the urethra is greatly lengthened; or it may affect one side more than the other, in which case the canal will be twisted; or it may affect the posterior median portion, which lies between the ejaculatory ducts, enlarging it into what is commonly called the *middle* or *third lobe*; a lobe which, according to Mr. Thompson, is purely the result of unnatural enlargement and does not exist in health. The consequence of this is, that there is a projection at the very orifice of the urethra, causing a most serious impediment to the issue of the urine. The prostatic portion of the urethra, besides being lengthened, twisted, and obstructed, may be very much narrowed; or, on the contrary, may be expanded into a sort of pouch, which may communicate with cavities formed by the dilated ducts of the gland, and contain calculous matter. Hypertrophy and derangement of the muscular fibres at and near the *trigone*, may produce a transverse bar at the neck of the bladder.

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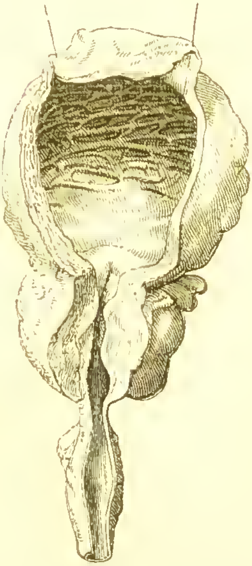

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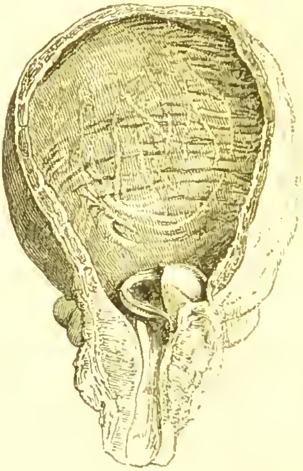

The enlargement, further, may be due to an increase of the organ generally; or to the development of one or many masses of FIBROUS TUMOUR; exactly similar in structure to those concentric masses of muscular fibre, which are developed in the womb, and are commonly known as *fibrous tumours*. One or more of these masses, involving more or less glandular tissue, may be developed alone, and may project as a pedunculated tumour; or may be contained within the mass, capable of enucleation, and may constitute the whole disease ; or may be combined with general hypertrophy.

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* Enlarged prostate. † Cyst of the prostate from the King's College Collection.

The *symptoms* of this disease may be divided into those which the surgeon ascertains by physical examination, and those of which the patient himself makes complaint. On examination, by means of a well-oiled forefinger introduced into the empty rectum, the surgeon ascertains the existence of the tumour ; and on using the catheter, finds an obstruction at the neck of the bladder. Most probably, too, after the patient has voided all the urine that he can, the catheter will relieve him of a further quantity.

The symptoms which the patient describes are slowness and difficulty in making water, sense of weight in the perinæum, and tenesmus; so that, as Coulson observes, he often believes he has internal piles. In the next place, the bladder becomes irritable, and the calls to make water are oftener than before. Then, as the patient cannot empty the organ completely, in consequence of the projection formed by the tumour, a portion of urine always remains behind, and decomposes, and becomes ammoniacal. Sometimes a fit of complete retention ensues, and it may be brought on by exposure to cold or excess in venery. Next the mucous coat of the bladder, irritated by the frequent strainings, and by the alkaline urine, inflames and secretes a viscid mucus. Finally the obstacle continuing to increase, the bladder is constantly distended, the urine perpetually dribbles away, the ureters become dilated, the kidney disorganised, the patient's little remaining strength is exhausted, and he dies. Abscess in the gland, or ulceration of that surface which projects into the bladder, sometimes adds to the patient's misery, and hastens his death.

The *causes* of this hypertrophy are as unknown as those of any other tumour. It generally commences, as Sir B. Brodie observes, about the time that the hair turns gray, and when earthy specks begin to be deposited in the coats of the arteries. Not, however, that all old men have enlarged prostates; on the contrary, as Mr. Thompson observes, the change is abnormal and exceptional. Out of forty-three specimens from men of 50 and upwards, he found two atrophied ; nine enlarged slightly ; and only five considerably, or to such a degree as to have given rise to symptoms during life. He believes that the change rarely begins before fifty-five, or after seventy.

Treatment.—This must be palliative. The patient should avoid irregular diet, fatigue, and exposure to cold. The bowels must be kept easy, so that there may be no straining at stool ;—irritation of the bladder must be alleviated by the measures we shall speak of in the next section ; and occasional fits of pain or congestion by leeching and hot baths. The surgeon must take care that the bladder is regularly emptied, and if not he must introduce the catheter at intervals to get rid of the residual urine. The catheter should be long ; its curved portion about a quarter of a circle whose diameter is 4·5 or 5 inches.

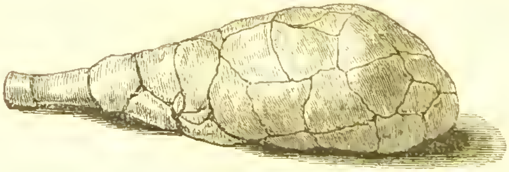
The handle should be well depressed between the legs as the point is entering the bladder, in order that the point may ride over the projection. The finger also may be introduced into the rectum to guide it. A small gum catheter which has been kept a long while on an iron wire of the proper curve, may be useful. A silver catheter, with a very short abrupt curve, is recommended by Coulson.

In order to empty the bladder completely, it may be necessary to turn the patient on his hands and knees. In any long-neglected case the urine may be drawn off in small quantities at a time, and the strength be well supported with tonics, wine, and plenty of nutriment.

Radical remedies for producing absorption of the tumour, such as mercury, the iodide and bromide of potassium, and certain mechanical arrangements, have been proposed. But in the present state of knowledge, it is not desirable to use any such remedy in any way that shall interfere with the patient's health and comfort.

V. COMPLETE RETENTION OF URINE from enlargement of the prostate. In this case, if there are inflammatory symptoms, cupping from the perinæum, the hot bath, and opium are indicated. The catheter should be passed if possible. If, however, the catheter cannot be passed by the natural route, the surgeon, guiding it with his left forefinger in the rectum, may thrust it through the projecting part of the gland into the bladder, or he may use a lanceted stilette. But if this cannot be done, the last resource is puncture of the bladder; by the rectum, if possible; if not, above the pubes.

VI. CALCULI of the prostate are composed, according to Dr. G. Bird, like other calculous concretions on mucous membranes, of phosphate of lime mixed with triple phosphate, and may be deposited either in the dilated urethral canal of an enlarged prostate, or in the ducts and cells of the gland, or in both. The most remarkable instance of prostatic calculus on record is related by Dr. Herbert Barker, of Bedford, to whose kindness the writer is indebted for the annexed engraving of it. The entire calculus is nearly 4⅞ inches in length, and, at its broadest extremity, 4⅝ inches in circumference, and weighs 1681 grains. It is composed of twenty-nine separate portions, slightly adhering by conchoidal surfaces, no doubt originally deposited in separate cells of the prostate, and the whole agglomerated into one mass by the absorption of the intervening tissue.*



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* Trans. of Provincial Medical Association, N.S., vol. iii.

The *symptoms* of these concretions are, at first, irritation of the neck of the bladder, and difficulty of micturition, as in other cases of enlarged prostate; the calculi may also be probably felt with the sound, or by the finger in the rectum. In some cases it may suffice to keep the urethra well dilated, so as to favour spontaneous escape; or it may be possible to remove one or more with the urethral forceps; but, should they cause great irritation, abscess, or retention of urine, it will be necessary to cut down on them from the perinæum, and remove them, as was successfully done by Dr. Barker.

VII. CANCER of the prostate is very rare. In one or two cases of hard cancer which occurred in Sir B. Brodie's practice, the gland was enlarged, of a stony hardness; there was great pain in the groins and perinæum, irritability of the bladder, and cancerous cachexia. Soft cancer is equally rare. The symptoms are nearly the same as those of cancer of the bladder.*

SECTION VI.—DISEASES OF THE BLADDER.

I. IRRITABLE BLADDER.—Many cases described under this title are cases of gout or of inflammation. Simple irritability, that is, a frequent inclination to pass the urine with or without spasm; but without inflammation or organic disease, may be caused, 1. By an irritating state of the urine; the qualities of which, and the presence or otherwise of oxalate of lime, triple phosphate, and albumen, should be ascertained; 2. It may be the effect of mere nervousness, which is not uncommon in elderly people, or of mental agitation; 3. It may be caused by irritation of the rectum, womb, or other adjacent organs; 4. By general debility; 5. By exposure to cold. The surgeon should examine into causes. Soothing medicines, such as belladonna, F. 149, may be of use.

II. NOCTURNAL INCONTINENCE.—Involuntary flow of urine during the night is common enough in delicate children; but the surgeon may be consulted on account of its continuing to an age at which such an infirmity becomes very troublesome and degrading. Any such case should be carefully studied under these heads. 1st. It should be ascertained whether the urine is irritating in quality or excessive in quantity; which it very frequently is. Thus, it will often be found, that the malady is aggravated when the bowels are confined, or the diet unwholesome, or saccharine drinks used too freely, or when there has been too much fatigue; all which circumstances must be avoided. (See Section 8.) 2nd. If there is nothing wrong in the urine, the condition of the bladder must be attended to; blisters to the sacrum; tonics, or very small doses of nux vomica, may be of service. 3rd. The habit must be attacked; the patient may be awakened at a certain hour, so that he may void his urine of his own accord: sometimes touching the orifice of the urethra with nitrate of silver, so that the flow of urine may cause severe smarting, is worth trying. Small doses of tincture of cantharides are also recommended; but the writer has more than once seen the malady increased tenfold by the empirical use of this drug in cases in which irritating and too copious urine was the source of the mischief.

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* For cases, see Coulson, op. cit.; Stafford M. C. T., xvii.

In cases of irritation of the bladder from any cause, immense quantities of epithelium may be passed with the urine, forming a thick white pus-looking sediment. It is easily distinguished by microscopical examination, and by the fact that the urine is *not albuminous.*

III. PARALYSIS of the bladder may occur under many circumstances. It may be caused by injury or disease of the head or spine: it is often present in typhus fever—it may be caused for a time by any severe injury, especially of the legs—it generally remains for a few days after the bladder has been long distended, whether from prostatic disease or stricture—and it sometimes occurs suddenly to nervous sedentary people, who, if they let their bladder get filled beyond a certain point, find that they cannot empty it. The symptoms of it are either retention of urine, *i.e.*, that the patient cannot make water; or else incontinence of urine, *i.e.*, that the water dribbles away without his being able to hold it. The diagnosis of retention through palsy, from retention through stricture, is easy. The retention from palsy comes on suddenly, and there is no obstacle to the introduction of a catheter. Yet palsy of the bladder may be combined with spasmodic stricture.

Treatment.—The catheter, if required; in pure palsy, the muriated tincture of iron: cubebs, buchu, strychnine. F. 21, 180, &c.

IV. INCONTINENCE AND DRIBBLING OF URINE.—This is a symptom that requires particular notice; because in nine cases out of ten it happens, not because the patient cannot *hold* his water, but because he cannot *pass* it,—either from stricture or enlarged prostate, or palsy of the bladder. For it must be noticed, that in either of these cases, so soon as the bladder becomes full, a little urine begins to dribble away through the urethra—and besides the patient may perhaps be able to squeeze out a little by straining with his abdominal muscles, and may believe his bladder to be empty, although all the while it is enormously distended. No surgeon will fail to put his hand on the pubes when he sees the urine dribbling away. The obvious remedy is the catheter.

V. HYSTERICAL RETENTION OF URINE.—There is one form of palsy of the bladder which is not unfrequent in hysterical women, and which consists in a deficiency of will rather than of power. They are not unable to empty the bladder if they try—but they are unable to try. These cases must be treated with purgatives, and fetid medicines, both internally and as enemata, F. 102. If the catheter is not employed, the patient will generally begin to make water so soon as she suffers much from distension.

VI. ACUTE INFLAMMATION of the bladder (*cystitis*) in young persons is most frequently a consequence of neglected or ill-treated gonorrhœa; in older persons, it may arise from gout; or it may be an aggravation of persistent chronic inflammation from stone, or stricture. The *symptoms* are pain, referred to the perinæum and sacrum, tenderness of the lower part of the abdomen, micturition exceedingly frequent, attended with great straining, and followed by an aggravation of the pain, a mucous or muco-purulent sediment in the urine, and fever. (See page 585.)

Treatment.—Leeches to the lower part of the abdomen or perinæum, hot baths, and warm fomentations; a good dose of calomel, followed by castor-oil, to divert irritating matters from the kidneys; opium by mouth, or by enema, or suppository, in sufficient doses thoroughly to allay pain, and the bicarbonate of potass, neutralized with lemon-juice, or F. 58, 78.

VII. CHRONIC INFLAMMATION of the bladder (*catarrhus vesicæ*) is a very frequent consequence of irritation from stricture, diseased prostate, or stone.

Symptoms.—Micturition frequent, and attended with scalding pain; the urine loaded with muco-purulent matter, which is sometimes tinged with blood, sometimes yellowish and puriform, but more generally grayish, streaked with white, alkaline, and excessively viscid, so as to stick to the bottom of the chamber-pot when turned upside down. In the early stages there is but little mucus, and the urine may remain acid; but as the disease advances, the quantity of mucus becomes enormous, and the urine is voided of a brownish hue, and of a most offensive ammoniacal odour. Moreover, it may clog the urethra, and cause retention of urine; a kind of retention difficult to manage, because the mucus clogs up the eyes of the catheter. In this stage there is very frequent desire to make water, and constant pain above the pubes. In general, the mucus contains *phosphate of lime*, which may be seen in it in white streaks, and which is apt to collect and form a stone in the bladder.

Ulceration.—Perhaps the mucous membrane of the bladder may ulcerate, and after death it may be found as cleanly dissected from the muscular coat as if it had been done with a knife. This will be attended with an intense aggravation of the pain in micturition, and with a dark colour of the urine; owing to the admixture of a little blood which exudes from the ulcerating surface, and which, after the urine is passed, sinks to the bottom like coffee-grounds. The bladder frequently throws out flakes of lymph, which become encrusted with patches of phosphate of lime. Moreover, it becomes exceedingly thick (the common opinion is that it is hypertrophical; Mr. Hancock finds that the thickening is inflammatory); and portions of it are apt to form pouches which are soon filled with mucus, or with phosphatic calculi. Finally, disease of the kidneys ensues, and the patient dies.

Treatment.—In the first place, if there is a stricture, or enlarged prostate, or stone in the bladder, proper measures should be taken for their removal or relief. In the next place, if the symptoms are at all severe, the patient should keep himself in the recumbent position as much as possible, with the pelvis elevated. Thirdly, if there is at any time a great aggravation of pain, and the strength is pretty good, a few ounces of blood may be taken by cupping on the sacrum or perinæum; but, as a general rule, all lowering measures are injurious. Pain and irritation are to be allayed by the hip-bath, and by enemata or suppositories of opium. Opiate plasters to the sacrum are sometimes of use. The bowels should be kept properly open by mild aperients. The diet should be nourishing, but plain; with weak brandy or gin and water, or sound sherry, for drink.

Of medicines, the most useful, according to Brodie, is the root of the pareira brava. Uva ursi, buchu, Chian turpentine, cubebs, copaiba, and tinct. ferri mur. in small doses three times a day, are remedies of similar virtues. Hyoscyamus or opium, and small doses of mineral acids, if the urine is highly alkaline, may be added to any of them. The sulphate of zinc may also be highly useful, F. 9, 181, 182, &c.

Injections into the bladder are not to be thought of when there is acute inflammation of the bladder, and blood mixed with the mucus, but they are highly serviceable in chronic cases, by relieving the irritability of the bladder, and washing out the organ, getting rid of the decomposed stinking urine and mucus. Injections of simple warm water are very useful: the best way of effecting them is that employed by Mr. Fergusson: it is to have a catheter with a double passage, and to throw in the water in a continuous stream by means of a small syringe like that of a stomach-pump. Three or four pints of water may thus be passed through the bladder daily. Injections of very dilute nitric acid (♏i—ii—ad ℥iss. aq. destil.) are of great service when the urine is highly ammoniacal. Injections of the nitrate of silver have also been used: these require a catheter of very pure silver strongly gilt; those of the acid may be passed through the nickel silver instruments used in lithotrity; or with an elastic bottle and elastic catheter.*

In the excessively painful case of ulceration of the bladder, opium given regularly and largely, and introduced into the rectum, is the chief remedy. Injections into the bladder of strong solution of extract of poppies, or of salts of morphia, may be tried.

VIII. CANCER and EPITHELIOMA sometimes affect the bladder either in the form of solid deposits, or of vegetations. The ordinary symptoms are frequent desire to make water; and uneasiness in the region of the bladder, aggravated after micturition, and often extending to the glans penis, perinæum, rectum, and groins. The urine is generally turbid, and deposits an adhesive purulent mucus, and it is very frequently mixed with blood, in irregular clots; and with these, portions of cancerous substance, or of epithelial granulations, are sometimes intermingled. These symptoms, combined with the absence of a calculus, and the probability perhaps of detecting a tumour within the bladder by means of the sound, or by examination of the rectum; or the tumour formed by the thickened bladder in the hypogastrium, and microscopic examination of fragments which pass, are the chief means of diagnosis. The epithelial granulation depicted at p. 106 was taken from the urine of a gentleman who died of epithelioma. The *treatment* consists in allaying pain by opiates, and in checking hæmorrhage and catarrh of the bladder by gallic acid or tincture of steel, and in giving an abundant diet.

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* See Coulson on the Bladder, &c, 4th edit., p. 170.

IX. VILLOUS VASCULAR GROWTH.—A growth of excessively fine arborescent tufts, consisting, like the villi of the chorion, of loops of large capillaries, and clothed with a cell-growth—generally proving early fatal from profuse hæmorrhage. Whether the growth be in its essential nature really vascular or warty, or epithelial, or cancerous, or sometimes one or the other, is yet uncertain. Mr. Partridge has collected some cases of this malady, and thinks that the frequent presence of blood in the urine, with no other morbid condition to account for it, is the best diagnostic sign.

X. POLYPUS of the bladder will display many of the symptoms of stone, but may be distinguished by not being moveable. It has been extirpated.

XI. TUBERCULOUS disease; abscesses bursting into the bladder; and cancerous or corroding ulceration spreading from the bowels, rectum, or vagina, must be treated on general principles.

SECTION VII.—DIAGNOSIS OF BLOOD, ALBUMEN, PUS, AND EPITHELIUM IN THE URINE, DISEASE OF THE KIDNEYS, HÆMATURIA, AND SUPPRESSION OF URINE.

I. ORGANIC DEPOSITS IN THE URINE.—This is the most convenient place for giving a brief description of those organic substances which are occasionally mixed with the urine, through disease of the organs which secrete it, or through which it passes. For a complete account of the subject, we must refer to Dr. George Johnson's work on the kidney, and to Dr. Lionel Beale on the "Microscope in Clinical Medicine." Here we can find room for a few practical remarks only.

1. *Blood* is very frequently found in the urine, rendering it dark and smoky if the quantity is but small, but betraying itself by red clots if the quantity is large. The blood-cells may be detected by the microscope, and the serum by the test to be presently mentioned. If it proceed from the secreting portion of the kidney, it will most likely be in small quantity, and uniformly diffused through the urine; and fibrinous moulds of the kidney tubules will be found in the sediment, and may be detected by the microscope. If the blood comes from the pelvis of the kidney, it may be in larger quantity, and there may be worm-like clots moulded in the ureters. (See *Hæmaturia*, p. 588.)

2. *Serum*, without red particles (*albuminuria*), is very frequently mixed with the urine; when the kidneys are affected with any of those forms of degeneration of chronic inflammation known by the collective term Bright's disease; or when, without original disease in themselves, they are exceedingly congested from pregnancy, disease of the heart, or

any other cause. It is not at all unfrequent in the urine of children at the commencement of the exanthemata, or, properly speaking, in most acute diseases. Serum may be detected by the discovery of its *albumen*, the presence of which causes serous urine to be commonly known as *albuminous urine.*

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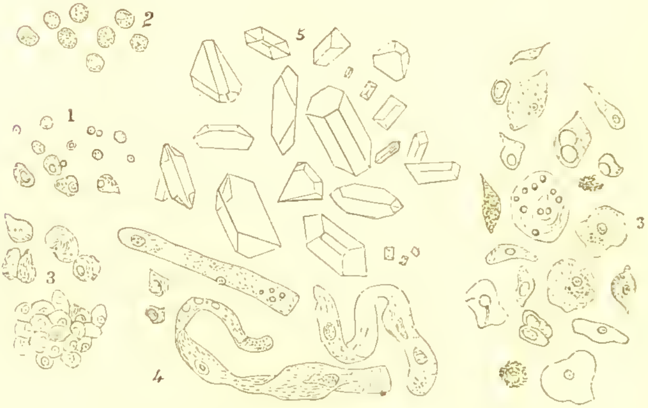

To detect albumen, heat a small quantity of filtered urine to the boiling point, in a test-tube over a spirit lamp; when the albumen will coagulate, and, according to its quantity, may either produce a mere opacity, or may even solidify the entire specimen heated. If the urine be alkaline, this test will fail, because then heat alone will not coagulate the albumen; and, moreover, heat alone may cause a deposit of white phosphates; therefore a few drops of nitric acid should be added after the boiling, which will dissolve the precipitate if phosphatic, but not if albuminous, and will throw down the albumen if the urine is alkaline.

3. *Fibrine* in the urine, when present in large flocculi from any ulcerated surface in the bladder, is readily distinguished. This substance, however, is most interesting when moulded in the tubules of the kidney, and accompanying albuminous urine; thus giving evidence of the seat of the effusion. These fibrinous casts of the tubuli uriniferi may vary much in size and appearance. They may be small and transparent, or large and transparent; or they may contain kidney epithelium in large or small quantity. When small, they show that they have been moulded in tubules *not deprived of epithelium.*

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* 1. Small globules; blood, nuclei, small epithelial cells, and spherules of oxalate of lime. 2. Pus. 3. Epithelium from the bladder; the typical form, a long oval, pointed at each extremity, with central nucleus; the younger cells spherical and pellucid; the older ones flattened, often full of granules or oil. 4. Small casts from the kidney, consisting of fibrinous matter entangling few epithelial cells; two of these cells distinct. 5. Triple phosphate.

4. *Epithelium*, from any part of the urinary organs, may be present in urine. Here we may recall to the recollection of our readers, that under slighter degrees of irritation the uniting medium which gives consistence to any epithelial or cuticular layer becomes loosened, the epithelium is formed in greater abundance, and is shed or *desquamated* more rapidly than natural. Under higher degrees of irritation or inflammation, the entire epithelial covering is stripped off or *excoriated*—a state of things usually followed by the evolution of pus globules on the inflamed surface. 1. The small round gland epithelium from the kidney, and the nuclei of disintegrated epithelium cells, are often found in small quantity in the urine when containing oxalate of lime, or when irritating from any other cause. 2. The kidney epithelium may be agglutinated by fibrinous effusion, and may be found in the sediment of albuminous urine in the form of *epithelial casts*, in those acute and chronic inflammations which Dr. G. Johnson calls *desquamative nephritis*. 3. The same epithelial cells and casts also may be found loaded with oil globules in certain stages of some varieties of Bright's disease. 4. The *epithelium from the pelvis, ureters*, and especially from the *bladder*, is often found in great abundance when these parts are irritated by the urine, or by any other cause. The writer has found immense quantities in the urine after difficult labours; it presents itself as a purulent-looking deposit, seen under the microscope to consist of columnar or oval cells, of very various shapes and sizes, with single nuclei, the larger and older cells often full of granular matter, and almost disentegrated. The urine is not albuminous of necessity. (See fig. 3, p. 584.)

5. *Mucus*, a viscid, stringy, structureless substance, coagulated by acetic acid; alkaline in its reaction, when proceeding from the bladder and fauces; acid, when coming from the vagina; not albuminous; often containing large quantities of phosphate of lime, and having the property of rendering the urine alkaline, and of precipitating triple phosphate. It usually contains some amount of desquamated epithelium, and a few globules, perhaps epithelial nuclei in a granular state.

6. *Pus* may be present in the urine, through suppuration of any part of the mucous lining of the urinary passages, or from an abscess in some contiguous part which has burst into them. It generally falls to the bottom of the vessel containing the urine, "forming a dense homogeneous layer of a pale-greenish cream colour, seldom hanging in ropes in the fluid, like mucus, and becoming, by agitation, completely diffused through it. The addition of acetic acid neither prevents this diffusion, nor dissolves the deposit. If a portion of the deposited pus be agitated with an equal quantity of liquor potassæ, it forms a dense, translucent, gelatinous mass. On decanting some urine from the deposited pus, the presence of albumen may be detected by heat and nitric acid."* The pus globules may be recognised under the microscope, and the addition of acetic acid reveals the characteristic nuclei. 1. When pus comes

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* Golding Bird on Urinary Deposits, 2nd edit., p. 273.

from the *uriniferous tubes*, the kidney being in a confirmed state of suppurative disorganization, it may sometimes be found moulded in the form of the tubules; but at all events it may be presumed to come from this source, if constantly present in the urine, and equably diffused through it, and if there are the other signs of kidney disease to be presently described. 2. Pus from the bladder will probably be mixed with large quantities of mucus, constituting muco-purulent matter. 3. Pus from an abscess will be variable in quantity, and not equally diffused. We must here remark that a few pus globules are often mixed with epithelial debris without the urine being albuminous.

7. The *Echinococcus* occasionally infest the kidney, producing severe disturbance. Small cysts, containing the animals, with their characteristic hooklets, p. 162, may be found in the urine, as in a case lately published by Dr. Herbert Barker. Turpentine in diuretic doses is the best means of dislodging them.

II. ACUTE INFLAMMATION OF THE KIDNEY (*Acute Nephritis*) is sometimes caused by blows on the loins, or by the irritation of renal calculi, but is very rarely an idiopathic primary affection. The *symptoms* are, burning pain and tenderness in the loins; colicky pains in the belly; the urine scanty and high coloured, and the bladder irritable, so that there are constant attempts at micturition; fever and great thirst, and vomiting. The remedies are—cupping, leeches, and castor-oil—repeated doses of calomel, opium, and antimony, with colchicum if the habit is gouty; warm baths, or warm fomentations to the loins, and barley-water and other demulcent drinks.

III. CHRONIC DISEASE OF THE KIDNEYS, when it comes under the surgeon's care, is generally a consequence of long-standing disease of the urethra or bladder. When the bladder has been subject to frequent distension through stricture or enlarged prostate, and its mucous membrane inflamed, the ureters are liable to become distended and converted as it were into subsidiary receptacles for the urine, so that all the violent strainings to evacuate it tell upon the kidneys; and these become diseased, through the mechanical irritation, and the extension of inflammation from the bladder. The pelvis and infundibula undergo suppurative inflammation—a state described as *pyelitis*, and then the disorganization of the uriniferous tubes easily follows.

Symptoms.—A person, who has long been labouring under some chronic affection of the bladder, begins to complain of general weakness and languor, both bodily and mental. The sleep is unrefreshing, the tongue nauseous, and the appetite lost. There is frequent pain of a weak aching character in one or both loins; occasionally shooting down to the testicles or groins. The urine is *albuminous;* it is generally pale-coloured and opakish when passed; sometimes it is tinged with blood, and sometimes containing shreds or flakes of lymph. As the disease proceeds, it deposits pus after standing. Fits of sleepiness, headaches, and sickness come on. These cases are almost sure to end fatally. Sometimes the patient dies of exhaustion and obstinate vomiting; sometimes of suppression of urine and coma; sometimes in a sudden fit of severe shivering; and sometimes of a rapid attack of

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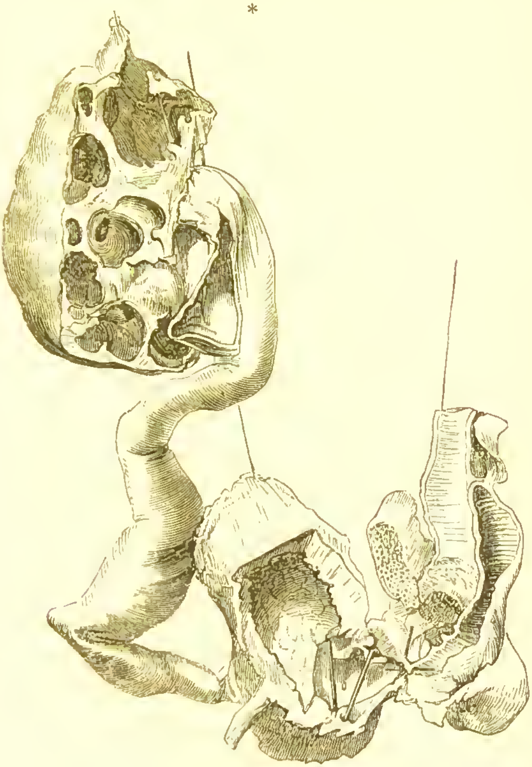

acute inflammation. The kidneys are found after death to be soft and disorganized; readily separating from their capsule, which however adheres firmly to the fat and cellular tissue of the loins; and most likely they are dilated into cysts; the secreting tissue being spread out over the dilated pelvis and infundibula.

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* This engraving, from a preparation in the Middlesex Hospital Museum, represents the beginning, middle, and end of a fatal case of disease of the urinary organs. It shows a tight stricture about three inches from the extremity of the penis; the urethra dilated behind it; another stricture in the membranous portion; false passages and abscess around; the bladder contracted in size but enormously thickened; the ureter dilated and tortuous, looking like an intestine; and the kidney expanded and atrophied, with scarce any of its secreting substance remaining.

IV. ABSCESS IN THE KIDNEY.—This may be suspected if dull pain in the loins and repeated shivering follow the symptoms of nephritis. Sometimes the abscess bursts into the ureter, and an immense quantity of pus is discharged with the urine. Abscess of the kidney also sometimes bursts on the loins, and the patient has been known to recover.

V. TREATMENT OF CHRONIC KIDNEY DISEASE.—On this subject we can but give a few general hints. When there is much tenderness in the loins, a moderate quantity of blood may be taken by cupping. Blisters or plasters of the emp. ammoniaci, or of opiamor belladonna, may also be of service. The skin should be kept warm by flannel. It will be necessary to provide for the free action of the liver and bowels, and to keep up the secretion of the kidneys, if deficient, by the milder sorts of diuretics, such as small doses of neutral salts; the infusions of buchu, and uva ursi, of carrot-seed, or of the root of parsley. The tartrate of iron will be of great service. The diet generally should be plain, but nutritious. If the loss of albumen is great, it should be combated by gallic or tannic acid, or tincture of galls or rhatany, or decoction of oak-bark internally, and by the use of strong essence of meat. F. 198.

VI. HÆMATURIA, or *Bloody Urine*.—The seat of the hæmorrhage may be either the kidneys, or the prostate or bladder. 1. Hæmorrhage from the *kidney* may be caused by the irritation of renal calculi, or by blows on the loins; by the congestion consequent on scarlet fever; and by other diseased states of the whole system, as in typhus and scurvy.

2. Hæmorrhage from the *prostate* or bladder may be caused by the rude introduction of instruments, or by the irritation of stone; or by the existence of an ulcer or fungoid tumour, of which, in fact, it is often the earliest manifestation. When the blood is derived from the bladder, some portion of it often flows pure after the urine is discharged, and it is in much greater quantity, and often in larger and more irregular clots than when derived from the kidneys; moreover, the pain in the back, and other signs of renal irritation that accompany bleeding from the kidney, will not be present.

Treatment.—When hæmorrhage from the kidneys is attended with inflammatory symptoms, cupping, purging, and the acetate of lead are indicated; when with symptoms of debility, the dilute sulphuric acid, alum, tinct. ferri muriatis, or gallic acid. Cold may be applied to the loins and hips by means of bladders of ice. In hæmorrhage from the bladder a catheter should be passed and be retained, in order to prevent both accumulation of blood in the bladder and straining efforts at micturition. If the hæmorrhage is obstinate, the bladder may be injected with cold water containing a scruple of alum to each pint; and if much blood have coagulated in the bladder, it may be necessary to break it down by repeated injections of water. Small doses of turpentine will sometimes check a hæmorrhage from the bladder, which resists all other means.

VII. SUPPRESSION OF URINE (*Ischuria Renalis*).—When the kidneys have been long abused by inordinate indulgence in strong drink, and are falling into disease—or when they have become diseased, they are liable suddenly to lose their function of secreting the urine. The consequence of this is, that the urea and other elements of the urine accumulate in the blood; the patient complains of great uneasiness in the head and loins; he becomes first drowsy, and then comatose, and dies in four or five days. This affection is alluded to here in order to hint at the diagnosis between it and retention of urine. In suppression, if the catheter is introduced, the bladder will be found empty; whereas in retention, whether from stricture, or from diseased prostate, or from palsy of the bladder, it may be felt full and distended above the pubes.

SECTION VIII.—URINARY DEPOSITS OR GRAVEL.*

In the urine are washed away the refuse matters derived from digestion, assimilation, and the wear and tear of the body. Any deviation, therefore, from a healthy state of digestion and nutrition is sure to be followed by a deviation from the healthy properties of the urine. So extensive and complicated is the chemical and physiological history of these changes, that we can but refer to the works of Prout, Liebig, Golding Bird, Bence Jones, Owen Rees, Garrod, Hassall, and Lionel Beale, and must confine ourselves to the immediate bearings of the subject on surgical practice.

We may observe that when the surgeon examines the urine, since it varies extremely in its properties at various hours of the day, the whole quantity that is passed during twenty-four hours should be collected into one vessel; so that its acidity and specific gravity and quantity may be fairly estimated.

We may observe as a further preliminary, that when a precipitate is let fall from the urine after it has been voided, it is called a *sediment:* that when precipitated in the bladder or kidneys it is called *gravel;* and that gravel lodging in any part of the urinary passages may concrete into *stone.* Further, that when the urine of any person habitually presents any one kind of deposit, he is generally said to have a corresponding *diathesis;* as the lithic diathesis, &c.

The principal diseased conditions we are at present concerned with are those in which the urine deposits—1st, uric or lithic acid; 2ndly, oxalate of lime; 3rdly, phosphates.

1. Lithic, or Uric Acid, or Red Gravel.—This is deposited in the form of minute crystals, tinged with the colouring matter of the urine. It generally indicates a highly acid state of the urine, through

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* For information on the subject of this and the following sections, consult Prout on Stomach and Urinary Disease; Garrod, Lancet, 1849; Bence Jones, Lancet for 1850, vol. i.; Brodie on Diseases of the Urinary Organs, 3rd edition; Golding Bird on Urinary Deposits, 3rd edit.; Hassall, Lancet, 1850-53; Lionel Beale on Microscope, 1854.

which it is precipitated from the ammonia and other substances which ought to hold it in solution.

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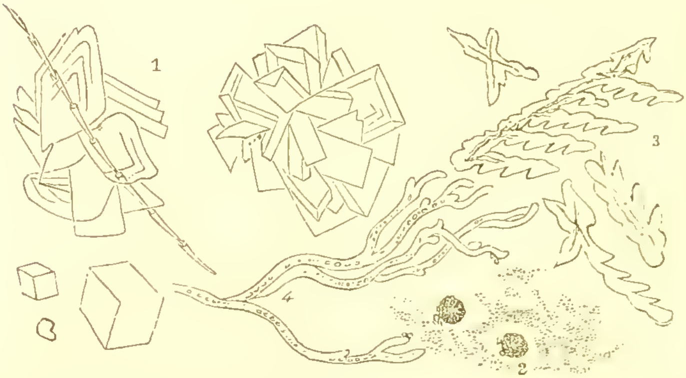

The amorphous *lithates of ammonia, soda, and lime* form a very common sediment, varying in colour from nearly white to dark red or yellow. The urine from which it is deposited is generally acid; clear when passed, but clouded as it cools; and this sediment may readily be distinguished by its dissolving when heated slightly.

Lithates, deeply tinged by pink or brick-dust colouring matter, form the sediments observed in fever, gout, and chronic diseases of the liver. The lithate of soda is sometimes found.

II. Oxalate of Lime is generally deposited from urine, which is highly acid, and contains much lithate. It is in the form of minute octahedral crystals, invisible except by the microscope. The dumb-bell form is rare, and probably an oxalurate.

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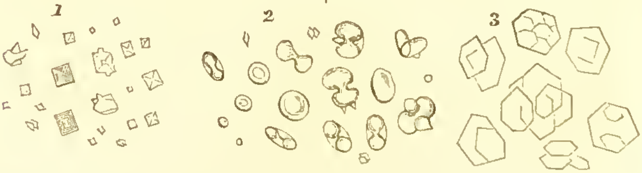

III. Phosphatic Deposits may arise in two ways. First, from excessive secretion of the mucus of the bladder. If the bladder be irritated from any cause so as to create this condition, the urine may be rendered alkaline by decomposition of its urea into carbonate of ammonia. But this is far from being any evidence of a *phosphatic diathesis.* For example, the writer has often found crystals of lithic acid, in highly-ammoniacal urine, which had doubtless been secreted acid; in gouty cystitis. Thus, an irritating—possibly over-acid state of the urine may be the cause of ultimate alkalinity.

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[*] 1. Lithic acid. 2. Lithates in powder, and spherules of lithic acid or lithate. 3. Basic phosphate. 4. Torula.

[†] 1. Oxalate of lime crystals. 2. Oxalurate ? of lime in pellucid spherules; single, double (or dumb-bells), and quadruple. 3. Cystine.

Secondly, they may arise from a primarily alkaline, or insufficiently-acid state of the urine, through which the phosphates of lime and of magnesia are precipitated; but they do not prove that *phosphoric acid is in excess* in the urine. The most common cause of alkalescence, or of deficient acidity in the urine, is surmised by Bence Jones to be excessive acidity of the stomach. Thus, as the writer of this work stated in the edition of 1841, the urine is often loaded with triple phosphate when the stomach is full of acid. In such a case the urine if alkaline is said to be so from preponderance of potass or soda. The ammoniacal urine which is commonly found in chronic cystitis, in disease or injury of the spinal cord, in the latter stages of prostatic disease, and under any circumstances which cause habitual retention of urine, is of the former variety. When urine is alkaline from ammonia, reddened litmus-paper steeped in it, and afterwards heated, recovers its red colour, which is not the case when alkalescence arises from the presence of fixed alkali. The varieties of phosphatic deposit are—1, the *triple phosphate* of ammonia and magnesia, which appears in sparkling prismatic crystals on the surface of the urine (fig. 5, p. 584); 2nd, basic triple phosphate, formed by the addition of ammonia either in the bladder or out of it, fig. 3, p. 590: and 3rd, the phosphate of lime, a white amorphous powder, generally associated with mucus.

Pathological Relations.—The lithic sediments, crystalline or amorphous, often accompany gout, and may exist in conjunction with a highly-sthenic plethoric condition; not that this is always the case, for they may indicate debility, malassimilation, or excessive fatigue. The oxalic generally indicate feeble powers of assimilation, and exhaustion of the nervous system. The phosphatic, when not arising from changes in the bladder, usually indicate low dyspepsia. Any deposit may exist occasionally in small quantity unnoticed; it is the constant or abundant presence which is an important evidence of disease.

When a patient is secreting the red crystalline gravel, or has, to use the vulgar phrase, a *fit of the gravel*, he usually complains of great pain in the loins and bladder; frequent desire to make water; and aching of the testicles and hips. Sometimes these symptoms are attended with great feverishness; sometimes with mere languor and dyspepsia.

When oxalate of lime is abundant, the whole urinary organs are apt to suffer extremely; with frequent micturition; aching in the loins and bladder; great irritation of the genital organs; often these symptoms are combined with peculiar lassitude, fits of headache, sour perspiration, nettle-rash, extreme despondency, and other signs of obstinate indigestion, and of a disordered condition of the blood.

Treatment.—The treatment of urinary disorders has of late years been made too dependent on a superficial chemical examination of the urine; it being the custom to give acids if the urine is alkaline, and so forth, without sufficient regard to other circumstances. The author stated in an edition of this work published in 1841, that this summary method of treatment was essentially erroneous. Subsequent experience has confirmed his ideas on this point; and he would advise his readers, under all circumstances, to treat the general health on rational principles, and leave the urine to take care of itself.

The first thing to notice, is the patient's blood-making powers, and his habits. Because if lusty and red-lipped, and a high liver, and troubled with lithic gravel of no long duration, he will generally be speedily relieved by full purgation; by reduced diet, warm baths, and liq. potassæ in drachm-doses thrice daily after meals. The diathesis will be kept at bay likewise by habits of early rising, by exercise enough to make the skin eliminate acid; by great temperance in meat and beer or wine; by freely eating fresh vegetables, and especially cabbage, water-cresses, and fruit, provided always that they cause no inconvenience to the stomach; and by occasional effervescing, alkaline, or saline draughts—such as lemon-juice, potass-water; Seltzer-water; or F. 58, 60, 61, 70, 72, 73, &c.

But far different must be the treatment if the urinary deposit, be it what it may, is created, not by an excess of material in the system, but by feebleness of the powers which ought to convert the food into healthy flesh and blood. In these cases the prime object must be to strengthen the digestion; and the means are the following—1. It is often beneficial to begin the cure by freeing the liver and bowels of black offensive scybalous motions, by a grain or two of calomel, with colocynth, or with some tonic purge, to carry it off. F. 37, 41, 50, &c. The motions should be inspected, and the medicine be repeated at discretion till they are rendered healthy. 2. There are few remedies comparable to *change of air*, including, as it must, change of diet, water, habits, and occupation, for the cure of all disorders of malassimilation. 3. *Alkalis* such as F. 77, 79, may be given in small doses after meals to the infinite comfort of the stomach, if the patient complains of sour eructations, flushed face, flatulence, &c., and this, no matter whether the urine is ammoniacal or not. 4. But the most important medicines are *Tonics*. Of these one of the most useful is the nitromuriatic acid, F. 22, which may always be given with benefit on an empty stomach, if the patient likes it; if he feels that it takes away that nauseous, flabby, alkaline condition of mouth which so commonly accompanies a low digestive power. But the other mineral acids—bark, quinine, nux vomica, and other bitters; the sulphates of zinc and of iron; and the muriated tincture of iron—will all be found useful. 5. *Opium* introduced into the rectum as a suppository is often necessary to allay local irritation, especially in phosphatic and oxalic cases. It may also be necessary as a means of procuring sleep, and preventing the nervous system from being worn out by its own irritability. 6. The *diet* should consist of those substances which are most readily convertible into good flesh and blood, and least liable to undergo degeneration during their solution in the stomach. Meat, good soup, milk, eggs, good bread, cruciferous vegetables—brandy and water, sound sherry, and bitter ale—show the kind of substances to be preferred; and pastry, sago, slops, and bad wine, the things to be avoided.

SECTION IX.—THE VARIOUS KINDS OF STONE.

The various deposits spoken of in the preceding section may, as we observed, lodge in some part of the urinary organs, and concrete into stone. There are altogether fourteen species, many of which are excessively rare. The principal ones are, the lithic, phosphatic, and mulberry.

I. LITHIC ACID calculi are generally oval, flattened, fawn or mahogany coloured, and on a section are seen to be composed of concentric laminæ. *Tests.*—This acid may be dissolved by boiling in *liquor potassæ;* it burns away almost entirely before the blowpipe, and if digested in a small quantity of nitric acid, and evaporated at a very gentle heat, it leaves a residue, which, when cold, becomes purple, if exposed to the vapour of ammonia.

II. LITHATE OF AMMONIA rarely forms a calculus, because it is tolerably soluble in warm urine. *Tests.*—It may be known by the same tests as the preceding, and, besides, it evolves ammonia when treated by liq. potassæ.

III. PHOSPHATE OF LIME or *bone-earth* calculi are rare. They are pale brown, friable, and laminated. *Tests.*—Soluble in nitric or muriatic acids, and precipitated by liq. ammoniæ; infusible except at a very intense heat.

IV. TRIPLE PHOSPHATE (*of ammonia and magnesia*) forms white or pale-gray calculi, composed of small brilliant crystals. *Tests.*—Evolves ammonia when treated with liq. potassæ; is soluble in acetic or muriatic acid; precipitated again by ammonia in form of crystals of basic phosphate.

V. The FUSIBLE CALCULUS is formed of the phosphate of lime and triple phosphate mixed. It forms a white friable mass like mortar, and is very fusible.

VI. The MULBERRY CALCULUS is composed of oxalate of lime. It is dark red, rough, and tuberculated. *Tests.*—Not dissolved by boiling in potass; soluble in nitric acid; if exposed to the blowpipe, the acid is burned off, and quicklime is left, which, if moistened, reddens turmeric paper.

VII. Besides the above, calculi are sometimes composed of *cystine*, a peculiar animal substance, containing much sulphur, soluble both in alkalis and dilute mineral acids, but not in acetic acid; precipitable in peculiar six-sided crystals by acetic acid from its solution in ammonia (see fig. 3, p. 590); also of *carbonate of lime;* of the *fibrine* of the boold, and of *xanthic* or *uric oxide*, a peculiar animal matter allied to uric acid. The lithate of soda, the lithate and carbonate of magnesia, and silica, are also rare ingredients in calculi.

Alternating Calculi.—Sometimes stones are composed of alternate layers of lithic acid and oxalate of lime; and very commonly the outer layers of a stone are phosphatic, the nucleus lithic or mulberry. The phosphates commonly succeed the other deposits, being surely produced after a time by the irritation of the mucous membrane; but the lithic and mulberry never coat the phosphates.

SECTION X.—STONE IN THE KIDNEY AND URETER.

Symptoms.—The symptoms of stone in the kidney are, pain in one or both loins; irritation and retraction of the testicles; the urine bloody after violent jolting exercise; and occasional fits of inflammation of the kidney. Stones in the kidney are most frequently composed of lithic acid, which will be known by the deposit of red sand from the urine. The oxalate of lime calculus is more rare. Crystals both of this substance and of lithic acid have been detected in the tubuli uriniferi. Phosphatic stone in the kidney is still more rare. When it does exist, it is generally composed of the phosphate of lime, and indicates incipient disease of the organ.

Treatment.—When a stone is ascertained or suspected to exist in the kidney, the indications are, *first*, to examine the general health, and treat any derangement according to the rules laid down in the previous sections; *secondly*, to endeavour to expedite the passage of the stone through the ureter, by diluents and diuretics; and by the *cautious* use of exercise so as to dislodge it; and, *thirdly*, to remove inflammation if it exist, by cupping on the loins, by mild aperients and copious enemata of warm water, by opium or henbane, and by warm baths or fomentations. Pounded ice applied to the loins gives great relief when much burning pain is complained of, but it must be used with caution.

The ordinary and most favourable event of renal calculus is, that it descends through the ureter into the bladder. In some cases, however, it remains in the kidney, increases in size, completely fills up the pelvis and infundibula, and causes the organ either to waste away or to suppurate; the abscess bursting either into the colon, or on the loins.

The Passage of a Stone through the Ureter causes the following symptoms:—The patient complains of sudden and most severe pain, first in the loins and groin, subsequently in the testicle and inside of the thigh. The testicle is also retracted spasmodically. At the same time there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder.

Treatment.—The warm bath, large doses of opium, emollient enemata, and plenty of diluents, are the obvious remedies, and an active purgative may perhaps be tried if the process is slow.

Sir B. Brodie has shown that there is a set of symptoms which sometimes affects gouty people—consisting of pains in the loins reaching to the groin and neck of the bladder; and scanty, high-coloured urine—which very much resemble those caused by the passing of a stone through the ureter. They may be distinguished by the absence of faintness and vomiting, and readily yield to purgatives and colchicum.

SECTION XI.—STONE IN THE BLADDER.

Stone in the Bladder produces the following *symptoms:* 1. Irritability of the bladder, frequent irresistible desire to make water. 2. Occasional sudden stoppage of the stream of water during micturition, from the stone falling on the orifice of the urethra; the stream probably flowing again if the patient throws himself on his hands and knees. 3. Occasional pain at the neck of the bladder, always severest after micturition. 4. Pain in the glans penis. If the patient be a child, he is always attempting to alleviate this pain by pulling at the prepuce, which becomes extremely elongated.

5. *Sounding.*—But none of the above symptoms must be depended on alone. The existence of the stone must be made sensible to the ear and fingers, and the instrument employed for this purpose is a *sound*, a solid iron rod, the size of a medium catheter, not large enough to distend the urethra. Its handle should be polished, and the surgeon should possess several, of various lengths.

One of these instruments should be introduced at a time when the urinary organs are comparatively free from irritation, and the health from disturbance. The patient should be on his back on a high bed, the pelvis raised on a pillow, and the bladder nearly, but not quite, full. In order to insure perfect quietness, and to prevent pain to the patient, he should be put under the influence of chloroform; and if the bladder is empty, tepid water should be injected. The sound should be carefully moved about, to examine every part of the bladder, and if there is a stone of any size it will most probably be heard to strike and felt to grate upon it. If nothing, however, is discovered, the patient may be made to turn on one side, or to sit upright, or the finger may be passed into the rectum; or a sound with the same abrupt curve as the lithotrite may be used to explore the *bas fond* of the bladder, behind the prostate; or a catheter may be introduced, and the stone may perhaps be felt to strike against it as the urine flows away. But if the symptoms are well marked, the surgeon must not be contented with one unsuccessful examination.

Diagnosis.—In sounding there are two *errors to be avoided. First*, that of assuming that there is no stone, when none can be felt. The chief circumstances which occasion difficulty in this respect are, enlarged prostate; cysts or pouches, in which the stone can be hid; and small size of the stone.

The second error is that of taking something for a stone which is not. Thus polypus or pendulous growths, portions of the bladder hardened, or rough from ulceration or from fibrinous deposit, or encrusted with phosphates; even exostoses and tumours of neighbouring parts, have at times been mistaken for stone.

The symptoms of stone vary in *severity*:—1, according to its size and roughness; 2, according to the state of the urine; 3, according to the condition of the bladder, whether healthy or inflamed. They may be very slight for years; in fact, a little pain in micturition and bloody urine after riding may be the only inconveniences. But after a certain period the bladder becomes more and more irritable, and finally inflamed; the urine alkaline, and loaded with viscid mucus and phosphate of lime; the strength fails; and finally, after years of suffering, the patient sinks.

The *sources* of vesical calculi are two:—1, the urine; 2, the mucus of the bladder; and calculi are exceedingly liable to form from the latter source, if the prostate is diseased, or if foreign bodies are introduced into the bladder, so as to serve for nuclei. In these cases the stone is invariably phosphatic.

The *composition* of a calculus may be judged of, but not always accurately, by the state of the urine. Its *size* may be appreciated:—1, by its composition, for the phosphatic are always the largest; 2, by the time it has existed; 3, by observing the force required to dislodge it from its situation; 4, it may be measured by passing the sound across its surface, or by the urethra forceps or lithotrite. Calculi have been known to vary in weight from a few grains to forty-four ounces, and in number from one to one hundred and forty-two. The largest that was ever extracted entire weighed sixteen ounces, but the patient died; Sir A. Cooper was the operator. Gooch tells us that Mr. Harmer, of Norwich, in the year 1746, extracted one entire which weighed nearly fifteen ounces, and the patient lived five years. And Mr. C. Mayo, of Winchester, extracted one weighing fourteen ounces and a half, but it was broken, and the patient lived several years.

Treatment.—The indications are:—1, to get rid of the diseased state of the urine; 2, to allay pain and irritation; 3, to remove the stone. The first and second are to be accomplished by measures which have been already spoken of when treating of gravel and of chronic inflammation of the bladder. The third may be executed in four ways, viz., 1, by extraction of the stone through the urethra; 2, solution of it by injections; 3, lithotrity; and 4, lithotomy—each of which requires to be treated of in a distinct section.

SECTION XII.—EXTRACTION OF STONE BY THE MALE URETHRA.

When a stone is known to have recently escaped from the ureter into the bladder, the first point is to remove all irritability of the bladder by sedatives, and by restoring the proper condition of the urine, so that there may be no spasm to obstruct its passage into the urethra. The patient also should drink plentifully, so that the bladder may be quite filled. Then, when he is going to make water, he should be instructed to lie on his face, and to grasp the penis so that the urethra may become distended with urine; and thus, very probably, the sudden gush that will come, when he relinquishes his grasp of the penis, will bring the stone with it. Moreover, the urethra may be well dilated by bougies. Should this plan not succeed after some days, Weiss's urethral forceps should be tried (p. 574), or still better, as Mr. Fergusson suggests, the *catheter scoop*, represented at p. 599, fig. 2, and employed to remove fragments after lithotrity. For the best mode of finding and seizing stones, see the Section on Lithotrity.

SECTION XIII.—LITHOLYSIS, OR SOLUTION OF STONE.

This has for its object the solution or disintegration of calculi, by means of liquids either taken by the mouth, or injected into the bladder. Sir B. Brodie long since showed that *phosphatic* calculi may sometimes be dissolved altogether, and sometimes be so disintegrated or reduced in size that they may escape through the urethra by means of the injections of very dilute nitric acid directed for chronic cystitis.

The *Vichy water*, a solution of bicarbonate of soda saturated with carbonic acid, has considerable effect not only on lithic calculi, which it dissolves by virtue of its alkali, but on the phosphatic, which it affects through its carbonic acid, and by disintegrating the animal matter which cements them together. Solutions of various alkalis and borax have been made the subject of numerous anxious experiments, with some, but not sufficient, good results.*

Dr. Elliott Hoskins, of Guernsey, one of the ablest and most persevering labourers in his department, has made experiments with the nitro-saccharate of lead.†

Dr. Bence Jones ‡ has shown that lithic and phosphatic calculi, fixed between the poles of a galvanic battery, and immersed in a solution of nitre, varying from ten to twenty grains to the ounce, at the temperature of the body, are capable of solution. Thus then the possibility of the solution of stone is established. Of course great difficulty may be expected in the practical application; but Dr. Jones informs the writer (February 8th, 1856), that he has succeeded in constructing an instrument which can be introduced into the bladder, and seize the stone, and subject it to the voltaic current. The material is that form of vulcanized India-rubber which is used in the manufacture of combs, and which is capable of insulating the current till it reaches the stone. The next thing will be to make experiment on a living patient, and to perfect the details of the operation.

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* For an account of which, we refer to Dr. Willis's work on Stone.

† Lond. Journ. of Med., Oct. 1851; Ranking, vol. xiv.

‡ Ranking, vol. xvii., quoted from Phil. Trans., 1852. Dr. G. Robinson, of Newcastle, is experimenting on the subject, and has published a pamphlet on Electro Lithotrity. Lond., 1855.

SECTION XIV.—LITHOTRITY.

Definition.—An operation for grinding or crushing stone in the bladder into fragments of so small a size that they may be readily expelled through the urethra.

History.—So desirable is this object, that it has been treated of, or attempted, by surgeons in every epoch of civilization; by Hippocrates amongst the Greeks; by Albucasis of the Arabian school; by Franco, Guido de Cauliaco, Hildanus, Haller, and others, down to the end of the eighteenth century. The attempts, however, were, as Mr. Coulson observes, isolated, and either fruitless or not carried out into a system till, in 1813, Gruithuisen, a Bavarian surgeon, published two memoirs on Lithotrity, and described his instruments, consisting of "a straight canula, intended to pass into the bladder and serve as a conductor for a perforator, which was either lance-shaped or dentated; a wire for seizing and fixing the calculus, a handle rapidly moved by a bow-drill, a branched forceps, and a hook for the purpose of crushing the fragments of stone when divided by the perforator." It does not appear, however, that these instruments were used either on the dead body or on the living, and the project was soon forgotten.*

Following the historical summary prefixed to Mr. Coulson's very complete and elaborate Lectures on Lithotrity, originally published in the Lancet for 1852, and now collected into a separate volume, we find that the person who next took up the subject was Civiale. In the year 1817, then a poor student, he constructed the models of some instruments, and the next year applied to the French Minister for pecuniary aid towards carrying on his experiments. His chief instrument was a double metallic tube, the inner tube having six elastic steel branches at its extremity: these were intended to grasp the stone, which was then to be bored by a lance-shaped *lithotriteur*. Pursuing his researches, Civiale, in 1819, reduced the six branches of his instrument to four, and in 1820 to three. He added a bow-drill; and with these improved instruments experiments were publicly made in 1822, at the Hospital of La Pitie, and in the dissecting-rooms of the Faculty.

In 1819, Mr. Elderton published in the April No. of the *Edinburgh Med. and Surg. Journal*, a proposal for attacking calculi with a curved two-branched instrument and perforator. But Elderton's proposal, like Gruithuisen's, was unfruitful; Civiale's was more fortunate.

In April 1822, M. Amussat described an instrument which he had constructed for *crushing* stone. This was a strong two-bladed forceps acting laterally, concealed in a canula, and worked by a lever. In June of the same year, M. Leroy, now better known as Leroy d'Etiolles, produced an instrument, consisting of a double canula, of four long watch-springs, attached to the extremity of the inner canula, to catch the stone, and of perforators worked by a bow-drill. In April 1823, M. Leroy produced an improved instrument. The appearance of this drew M. Civiale from his retirement; but not till May 1823 did he publish an account of his process. On January 10, 1824, he performed his first operation in the presence of Barons Percy and Chaussier, commissioners appointed by the Faculty. The patient was relieved of his stone in two sittings. Another patient, operated on Feb. 4, was cured in four sittings; a third equally quickly. Thus Civiale is to be regarded as the inventor of lithotrity.

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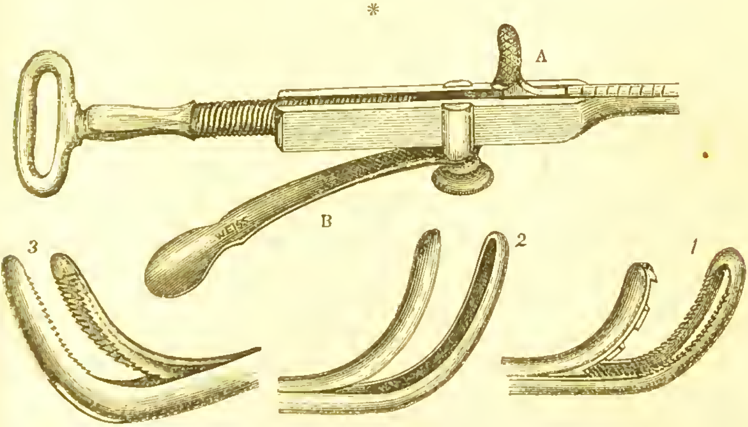
* Coulson on Lithotrity and Lithotomy, Lond., 1853.

Hitherto we have spoken chiefly of *boring* instruments. The first *crushing* instrument of any value was manufactured by Mr. Weiss in 1824. It was composed of two blades sliding on each other, and brought together by a screw. This is, in essentials, the instrument used at the present day. Sir B. Brodie, however, thought that the screw would act with such violence on a hard calculus that the bladder would be injured by the flying off of the fragments; and so for a time it was laid aside.

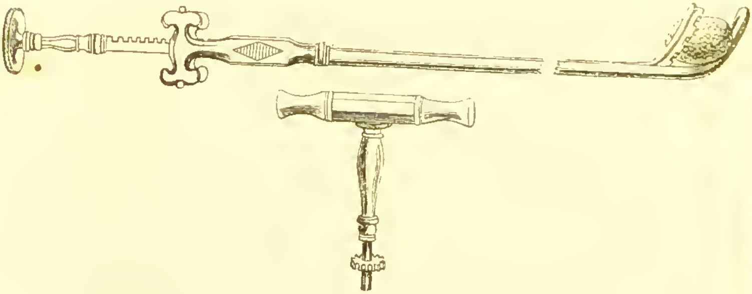


In 1825, Dr. Haygarth invented a sliding instrument, to which a screw was connected at the suggestion of Mr. Hodgson, who tried it on a patient in the Birmingham Hospital in the same year. To this distinguished surgeon belongs the honour of having first performed the modern operation of crushing.

* Weiss's Lithotrite with screw force. The upper or male blade is drawn back by the thumb upon A. The scale shows the degree of separation; B, the handle. 1. The end of the blades; 3, end of the blades of a lighter instrument for fragments; 2, end of a catheter scoop for permitting escape of detritus.

But the method which now acquired celebrity, and which was first practised by Heurteloup in 1830, consisted in hammering the stone to pieces. The patient was confined to a bed of peculiar construction, called the *lit rectangulaire;* and the *percuteur courbe à marteau*—a sliding instrument composed of three blades—was made to seize the stone. This was then broken by repeated blows with a hammer on the other extremity of the instrument, which was fixed securely to a vice. But this plan was fraught with many inconveniences. The instrument was too feeble; in one case it was bent up over the pubes; its blades were apt to become so clogged with pulverised fragments, that they were withdrawn with difficulty, or perhaps not until the orifice of the urethra had been slit up; and the bladder was exposed to injury from percussion communicated from the instrument, and from the violent splitting of the calculus.

Heurteloup's instrument was next improved and simplified by Costello, who seems to have reinvented the two sliding blades which Weiss had designed eight years previously. Mr. Oldham, a gentleman attached to the Bank of Ireland, devised the oval slit in the female blade, for the escape of detritus, shown in figs. 1 and 3. In 1834, Mr. Fergusson employed the hand-rack and pinion represented in the above cut.



The *Preparatory Treatment* necessary consists in correcting any detectable disorder of the digestive organs or general health, and allaying any irritation of the urinary organs, by hip-baths, opiates, and repose. The surgeon should also by sounding estimate the size of the stone, and the capacity and degree of irritability of the bladder; for so long as that is very irritable the operation must be delayed.

The operation is performed as follows. The patient is placed on a couch with his pelvis well raised, and his shoulders comfortably supported; the bladder is then emptied, and five or six ounces of warm water injected with a proper catheter and syringe. The injection should be accomplished with the greatest possible slowness and gentleness. The instrument, warmed and oiled, is now to be most gently introduced; and it must be passed fully into the bladder. The next step is to seize the stone. But for this purpose, as is well and forcibly stated by Sir B. Brodie * and Mr. Skey, it is not justifiable to move the instrument about in the bladder, or to use it as a searcher; on the contrary, as Mr. Skey says, the stone must be brought to the instrument. For this purpose, the blades having been opened—in doing which, as the same surgeon observes, the female blade should be pushed forwards to the same extent to which the male blade is drawn back—the blades should be pressed downwards towards the rectum, by raising the handle; so that the bladder may assume a conical form with the apex downwards. Into this apex the stone will most probably fall; if not, a slight shake given to the patient's pelvis will probably make it do so.

When the stone is fairly grasped, the screw or other mechanical force employed should be made to crush it; and here the first operation should generally end; for the surgeon must adopt *festina lente* for his motto, and must not be eager to do too much at one sitting. At the close of the operation it must be seen that the blades are entirely closed, and not choked by detritus; then the instrument is withdrawn.

The subsequent parts of the treatment are these. First, all pain, which is often severe, must be allayed by opium, administered by the mouth, or in the form of enema or suppository, F. 101, 174. Hip-baths, barley-water and other demulcent drinks, and alkaline medicines may be used with the same intention.

Secondly, the operation must be repeated at intervals, till every fragment is crushed and expelled. In favourable cases there is some degree of scalding and pain, which soon pass off, and allow the operation to be repeated in three or four days. In less favourable cases, there may be severe pain and spasm of the bladder, requiring an interval of six or eight days.

The *third* point is the getting rid through the urethra of the detritus and fragments. After each operation, and especially after the first, the patient should not attempt to make water for some hours; and should remain quietly on his back for two or three days. Probably he will not be able to make water, from the injury which the neck of the bladder has received, and will require the catheter. After subsequent operations, the removal of the detritus may be promoted by injecting the bladder with warm water through a catheter with a large eye; or the catheter forceps, fig. 2, p. 599, may be used. It may be expedient to make the patient pass water on his knees, especially if the prostate is enlarged.

If a fragment becomes impacted in the urethra and causes retention, it must either be gently pushed back into the bladder; or extracted by the urethra forceps, or by probe or hook; or crushed in the urethra; or lastly, be cut down upon from the perinæum. See p. 573.

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* Brodie, Med. Chir. Trans., vol. xxxviii.; F. C. Skey, on the Merits of the Two Operations for Stone, Lond., 1854.

Contraindications.—The circumstances which render the operation of lithotrity difficult or dangerous, relate 1, to the *urethra;* for if this be naturally small, as in children, or strictured by disease, and incapable of being dilated so as to admit the necessary instruments, lithotomy is to be preferred to lithotrity. 2. Unconquerable irritability and contractility of the *bladder*, especially if already thickened by disease. 3. Very great enlargement of the *prostate*, and especially of the so-called third lobe, which hinders the manipulation of the instrument and the escape of detritus. 4. Great size of the stone, such as a greater diameter than two inches, especially if accompanied with great hardness, and if there are more stones in number than two. If these be the contraindications, it will be readily inferred that the—

Cases in which Lithotrity may be beneficially resorted to, are those in which 1, the patient is an adult, with a full-sized *urethra;* 2, in which the *prostate* is not enlarged; or at all events, in which, if the prostate be slightly enlarged, the stone is small, and other circumstances favourable; 3, in which the *bladder* is free from thickening, extreme irritability, and *purulent* catarrh. Simple mucous catarrh is no contraindication; in fact, being caused by the presence of stone, it will be relieved by that which removes its cause. Lastly, in which the stone is single, or in which at least there are not more than two; not large; nor very hard. The oxalic are the hardest and most intractable of all.

This operation may be followed by rigors, and great constitutional disturbance and debility: or by inflammation and abscess in the pelvic areolar tissue; which may prove fatal; but Sir B. Brodie gives it as his opinion, that if prudently and carefully performed, with a due attention to minute circumstances, it is liable to smaller objections than almost any other of the capital operations in surgery.

It must be observed, in conclusion, that the benefits of lithotrity are most fully evinced when patients apply for relief at the earliest possible period after the descent of the stone into the bladder.

SECTION XV.—LITHOTOMY.

Definition.—The best definition, is the homely English phrase, *cutting for the stone.*

The *Indications* for this operation may be defined to be, the presence of a stone in the bladder, which it is not judged expedient to remove by lithotrity.

The only *Contraindication* is the presence of such serious organic disease, and especially of the kidneys or lungs, as would render the patient likely to sink from the immediate effects of the operation. But the surgeon is not justified in withholding a means of relief, if the only one, and if the patient desires it, merely out of regard to his own reputation for success in operations.*

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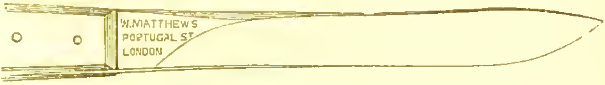
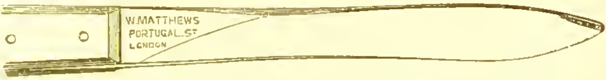
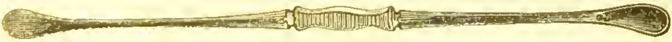
* The mortality from this operation increases as the age does. Out of one hundred and eighty-six cases, collected by Mr. Hutchinson, one hundred and

There are several methods in which lithotomy may be performed, viz., the lateral operation—the bilateral—the recto-vesical—and the high operation;—to which may be added Mr. Allarton's. The lateral is that which common consent has decided to be the best, except in a few rare instances. There are an infinity of minute variations in the manner of performing it, and in the instruments employed by different surgeons. In the following pages the author proposes to describe chiefly the method employed by Mr. Fergusson, which he has had many opportunities of witnessing at the King's College Hospital.



1. LATERAL OPERATION.—The instruments needed, are the following: A sharp-pointed knife; a straight probe-pointed knife if necessary to enlarge the internal incision; a curved staff, deeply grooved;—it should be large, the groove deep and not extending more than half way up the straight part of the instrument;—Mr. Fergusson's staff has the groove on the left side;—forceps of various sizes, and scoops for extracting the stone; and a sound to make sure that the bladder is empty after the operation. Needles and tenacula; canulæ and a stone crusher may be at hand, in case of need.





It is advisable that the bowels should be cleared in the morning with a simple enema. The bladder should be moderately full, and if the patient has recently emptied it, a few ounces of water may be injected.

The surgeon must take care that there is a good firm table for the operation; about two feet and a half high. When the time is come, the patient should lie down on this, and be put under the influence of chloroform. Then the staff may be introduced, and should be made to act as sound, to make clear the existence of the stone to the operator and his assistants. If the staff does not serve this purpose, a sound must be used; for this is a point about which there should be no mistake.

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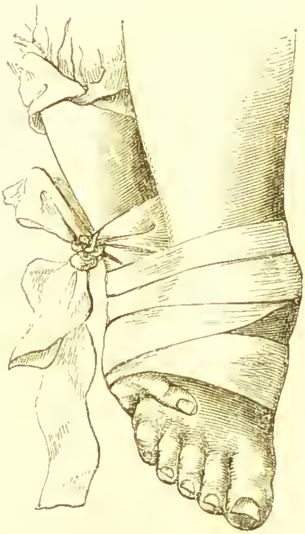
thirty-seven were under the age of twenty, and of these one hundred and twenty-three recovered; forty-nine were over twenty years, and of these no fewer than twenty-six died, or more than half. See Med. Times and Gaz., Jan. 8th, 1859.

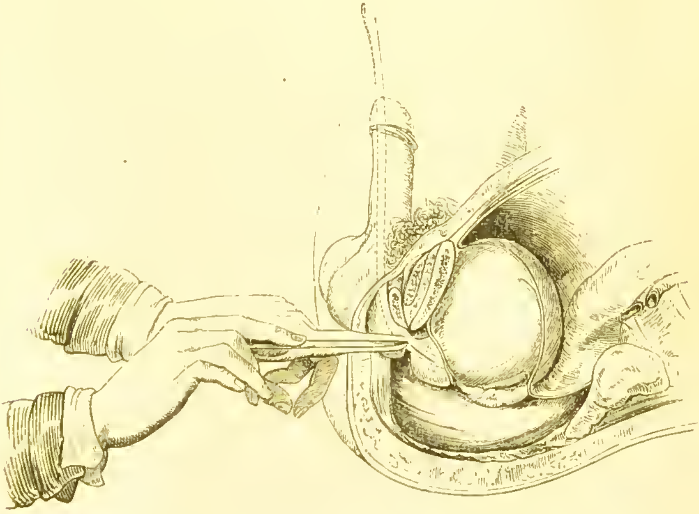
The next point is to place the patient in a convenient posture. He should be placed on his back, with his shoulders resting in the lap of an assistant, who sits astride behind him. Then, in order to expose the perinæum thoroughly, he must be made to raise and separate his thighs; and to grasp the outside of each foot with the hand of the same side; and the hand and foot are to be firmly bound together by a broad garter. The buttocks should be brought to the edge of the table; meanwhile, if not done before, the perinæum should be shaved. The surgeon may, says Mr. Fergusson, pass his left forefinger well oiled into the rectum, to ascertain the size of the prostate, and its depth from the surface; he should also explore with his fingers the surface of the perinæum, and the position of the rami and tuberosities of the ischia.



Everything being now prepared, an assistant on each side holding the thighs firmly asunder—another being at hand to give the surgeon his instruments—and a fourth stationed on the left side holding the staff perpendicularly, and well hooked against the symphysis pubis—in which position he is to hold it steadily from first to last;—and keeping up the scrotum out of the way;—the surgeon places the fingers of the left hand on the right buttock, and with the thumb fixes the integuments of the perinæum, taking care, however, not to draw them up too much. Then he commences by a free division of the skin, with more or less of the subjacent tissues; entering his knife just on the left side of the raphe, about an inch and three quarters in front of the anus, and cutting downwards, with a sawing motion, to midway between the anus and the tuberosity of the left ischium. "The blade of the knife," says Mr. Fergusson, "should next be run along the surface of the exposed fat and cellular tissue, and then the forefinger of the left hand be thrust into the wound, about its middle, and directed upwards and forwards between the left erector and accelerator muscles." If any muscular fibres of the transversus or other tissue offer resistance, they may be divided by a touch with the knife; but usually they give way before the finger, which reaches and feels the groove of the staff in the membranous part of the urethra. This is the first stage of the operation.

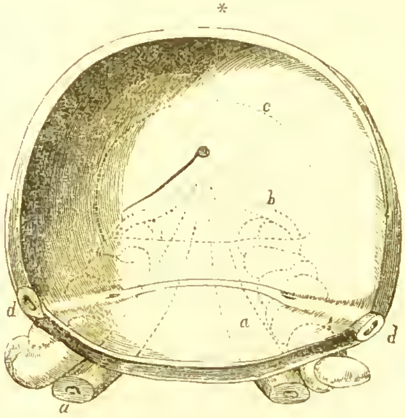
The left forefinger nail being now well fixed in the groove of the staff, the knife is slipped in over it, with its flat surface nearly horizontal; its point is made to pierce the tissues covering the staff and to enter the groove, and to slide along the groove towards the bladder, dividing the membranous part of the urethra, and the edge of the prostate. This completes what the French would call the second *temps*.

Now the knife being withdrawn, the left forefinger is gently insinuated along the staff into the bladder with a rotatory kind of motion, dilating the parts as it enters; and is made to feel for the stone. In the next place, the assistant removes the staff, and the surgeon cautiously introduces the forceps over the finger into the bladder; the finger being withdrawn as the instrument enters. And, at this moment, Mr. Fergusson, with admirable dexterity, opens the blades, and catches the stone as it is brought within their jaws by the gush of urine that escapes. For it must be observed, that so closely does the finger follow the knife into the bladder, that no urine escapes, till the finger is withdrawn.



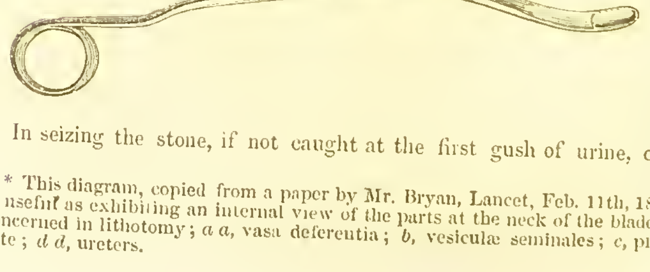
If, however, the stone is not caught in this ready way, the forceps must be closed and brought into contact with it—then the blades be opened over it and made to grasp it; if seized awkwardly, it is relinquished and seized again—then it is extracted by slow, cautious, undulating movements. The forceps should be held with the convexity of one blade upwards and of the other downwards; and the endeavour should be to make the parts gradually yield and dilate, not to tear them.

The *general maxims* to be borne in mind during the performance of this operation are, 1, to make a free external incision, and to bring it low enough down, so that the urine may subsequently escape freely without infiltrating the cellular tissue; 2, not to cut deeply too high up, nor to open the urethra too much in front, for fear of dividing too much of the urethra, and wounding the artery of the bulb; 3, not to wound the rectum, or pudic artery, by carrying the incisions too low, or cutting too much inwards or outwards;—the left forefinger should protect the rectum throughout; 4, not to cut *through* the prostate.



It will be noticed that after the first incision, the use of the knife is very limited indeed. Yet, if the stone is very large, the prostate very hard, or if any muscular or other tissues resist the finger as it passes in, they may be touched with the edge of the blunt-pointed bistoury. In fact, the right side of the gland may be divided, equally with the left. Also after the stone has been grasped, the same may be done if needful.

The usual *pons* of young operators, is the difficulty of getting the finger and forceps into the bladder, and the propensity to let them slip between the bladder and rectum.



In seizing the stone, if not caught at the first gush of urine, care must be taken not to grip the bladder with it. The forceps should have long blades, curved so as to retain the stone without undue pressure. They may be lined with linen, which affords a firmer hold, and takes up less room, and is less likely to crush the stone than the metallic teeth usually employed.

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* This diagram, copied from a paper by Mr. Bryan, Lancet, Feb. 11th, 1843, is useful as exhibiting an internal view of the parts at the neck of the bladder, concerned in lithotomy; *a a*, vasa deferentia; *b*, vesiculæ seminales; *c*, prostate; *d d*, ureters.

The extraction of the stone resembles a problem in midwifery. As the os uteri must not be allowed to come down before the child's head and get jammed between it and the pubes, so the surgeon must not drag down the prostate in front of the stone, and jam it against the ramus of the ischium. It may be useful, says Mr. Fergusson, to push it back over the forceps with the left forefinger. Moreover the extracting force must be directed downwards where the interval between the bones is the largest.

If the stone is so large that it will not pass, there is the choice of crushing it, by a huge lithotrite, or by a screw instrument invented by Haynes Walton; or of performing the high operation. A surgeon in America finding himself unable to extract a stone by the perinæum, immediately cut into the bladder above the pubes, and extracted it that way. The patient recovered.

If the stone is adherent, or encysted, the finger-nail and the scoop must be employed to detach it. If pouched behind the prostate, a finger in the rectum may lift it within reach of the forceps. If grasped by the bladder behind the pubes it may be brought down by injecting the bladder with warm water.

The *varieties of this operation* before alluded to are as follow. Many surgeons direct the assistant to hold the staff so that it may project in the perinæum, and incline a little to the left side of it,—and when they have opened the urethra, and are about to incise the neck of the bladder, they take its handle in their own left hand, and bring it down horizontally. *Mr. Key* preferred a straight staff. Again, there are great diversities in the manner of cutting into the bladder. Some use a *bistouri caché*, an instrument containing a blade that protrudes to a certain extent on touching a spring. *Sir B. Brodie* preferred a *beaked knife;* or, if the stone is very large, a double-edged knife with a beak in the centre, so as to divide both sides of the prostate. When the bladder is opened he directs the wound to be dilated by means of the *blunt gorget*, which distends the neck of the bladder, and splits cleanly through the prostate, without any risk of hæmorrhage or mischief. Many surgeons open the bladder by means of the *cutting gorget;* the beak of which being put into the groove of the staff, held horizontally in the operator's left hand, is pushed cautiously on, and made to cut its way into the bladder. If this instrument is employed, every precaution must be used to keep it in contact with the staff, and not to let it slip between the bladder and rectum—an accident that has been the death of not a few. The late *Mr. Avery* constructed a most ingenious instrument, by means of which a baby might perform lithotomy. A staff introduced into the bladder contained machinery, through which, by turning a handle, a trocar was made to pierce the perinæum from within; thus making it impossible to miss the bladder. *Professor Buchanan*, of Glasgow, employs a rectangular staff, with the shorter branch grooved in its side. This is introduced and made to feel the stone. The surgeon introduces the left forefinger into the rectum (where he keeps it during the whole operation), feels that the prostate is between his finger and the short branch of the sound, keeps the angle of the staff just in front of the gland, and depresses the handle, so that the angle may project in the perinæum between the anus and bulb, and that the left thumb may feel the groove. The handle is now committed to an assistant, with instructions to depress it steadily, and keep it in the same position. The surgeon then plunges a bistoury into the groove of the staff in the middle line just above the anus, at the point where the skin and mucous membrane meet. The bistoury (a straight and sharp backed instrument whose blade, cutting on both edges near the point, and is of the same length as the short branch of the staff) is pushed to the extremity of the groove, being kept strictly at right angles to the handle of the staff. In withdrawing it, it is made to cut at first outwards and downwards, then directly downwards, so that the incision turns as it were round the finger in the rectum. The advantages of this operation are said to be, that it is simple and easy; that it is free from hæmorrhage, because removed from the transverse vessels of the perinæum; and that the incisions are small, and yet the wound roomy, from the extensibility of the rectum.

Buchanan's staff has been modified by Mr. Hutchinson, who has converted it into a grooved catheter staff, with a stopcock; so that the surgeon may be certified, by the escape of urine, that he has really reached the bladder, and may inject water if need be. Dr. Corbett has added to Buchanan's staff another external staff, the short branch of which is pointed; and which is so contrived that when the first staff is introduced into the bladder, the second external staff is fitted in; its short branch perforates the skin and falls into the groove of the short limb of the first staff, and so the road from the skin into the bladder is unmistakable.*

After-Treatment.—The surgeon—especially if the stone has been crushed, or if there is reason to suspect more than one—makes certain by means of the sound, or by syringing the bladder, that every fragment has been removed. Mr. Fergusson introduces a suppository of morphia, before the patient is removed to his bed. The patient should lie on his back with his shoulders elevated; a napkin should be applied to the perinæum to soak up the urine, and the bed be protected by oilcloth. Some surgeons introduce a large gum elastic canula through the wound into the bladder for it to flow through for the first twenty-four hours. If not, the surgeon should introduce his finger after a few hours, to clear the wound of coagula. Pain must be allayed by opium—the bowels be kept open with castor-oil—the wound be kept perfectly clean—the diet be nourishing—and then, in favourable cases, the urine begins to flow by the urethra in about one week (sometimes in three or four days), and the wound heals completely in four or five.

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* See Hutchinson's paper, Med. Times and Gaz., Feb. 21st, 1857; and Corbett, ib., Dec. 8th, 1858.

Complications.—1. Severe *hæmorrhage* may proceed at the time of the operation, or after it, from the pudic or bulbous arteries if wounded. If the bleeding orifice cannot be secured, it must be compressed as long as may be necessary with the finger. A general venous or arterial oozing must be checked by filling the wound firmly with lint or sponge—the tube being then indispensable; and by ice applied to the perinæum, or lower part of the abdomen. Care should be taken that blood does not accumulate in the bladder. This may be suspected if the patient is pale and exhausted, and must be combated by injections of cold water, to make the bladder contract. 2. Sloughing of the cellular tissue from urinous infiltration—a frequent result of a hasty operation, and of too freely incising the neck of the bladder—is indicated by heat and pain about the neck of the bladder; heat of the skin and sleepiness, followed by a rapid jerking intermittent pulse—hiccup—the belly tympanitic, the countenance anxious, and the other signs of irritative or typhoid fever. To be treated by wine and bark, thoroughly opening the wound with the finger, and, if necessary, laying the wound into the rectum, so that the urine and fetid discharge may escape. 3. *Simple peritonitis*; pain and tenderness extending from the bladder over the abdomen, must be treated as directed at p. 505. 4. *Pyæmia*, see p. 60.

II. THE BILATERAL OPERATION is performed by making a curved incision, with the convexity upwards, from one side of the perinæum to the other—carrying it between the anus and bulb of the urethra—opening the membranous portion of the urethra—and then pushing a double *bistouri caché* into the bladder, by which both sides of the prostate may be divided.

III. THE RECTOVESICAL OPERATION consists in cutting into the bladder from the rectum, in the middle line behind the prostate.

IV. THE HIGH OPERATION is performed by making an incision through the linea alba, and opening the bladder (which is projected upwards on the point of a catheter) at its fore and upper part, where it is not covered by peritonæum. This operation may be occasionally resorted to when the stone is of great size, and the prostate much enlarged, or the space between the tuberosities of the ischia contracted.

V. Some years since Dr. Willis proposed an operation, which he called LITHECTASY, or CYSTECTASY, in which, after the membranous part of the urethra was laid open, the prostate was dilated by fluid pressure, till it admitted of a forceps being introduced to seize the stone. The success of this operation, in the six or eight cases in which it was tried, was not great—probably because the patient was kept too long under treatment.*

An operation on the same principle has been proposed by Mr.

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* See Willis on the Urinary Organs; Ranking's Abstract, vol. iii., p. 119.

Allarton.* A staff with a central groove is introduced, and held firmly against the pubes. The operator having introduced his left forefinger into the anus, and pressing its point against the staff in the prostate, passes a long-handled straight-pointed knife into the perinæum, exactly in the middle line, about half an inch above the anus, till it hits the groove in the staff. Then he moves the point of the knife a few lines towards the bladder, and next withdraws it, enlarging the incision upwards as he does so, to the extent of from three-quarters of an inch to an inch and a half. Next, he passes a long ball-pointed wire or probe along the groove of the staff quite into the bladder, and withdraws the staff. Following the guidance of the wire, the operator insinuates his left forefinger, well greased, along it through the prostate, dilating the parts as it goes onwards. Now if the stone is small, it probably comes in contact with the finger; and if the patient strains, will follow the finger as it is withdrawn, and come out. If not, the wound in the prostate may be further dilated by Weiss's female dilator, or by the end of the forefinger enlarged by the superimposition of several india-rubber finger-stalls. In cases of difficulty, the stone may be crushed, or the operation converted into the common bilateral one. Amongst the advantages of this operation, Mr. Allarton enumerates the impossibility of missing the bladder; the small amount of cutting, and of danger; and the fact that the patient, from the wound being in the middle line, preserves the power of the muscles, and can strain so as easily to bring the stone within the reach of the operator.

SECTION XVI.—STONE IN WOMEN.

STONE IN WOMEN is much less frequent than it is in men, and when a renal calculus reaches the bladder, it is much more easily voided. If, however, there is a calculus too large to escape, it must be removed.

1. The surgeon may employ *lithotrity*.

2. The orifice of the urethra may be simply dilated, which may be effected by *Weiss's female dilator*, slowly or quickly as may be desired.

3. Not to mention the plans for cutting into the bladder from the vagina, or other parts, the orifice may be incised.

4. Incision may be combined with dilatation.

The great evil is the almost certainty that more or less incontinence of urine will follow. Mr. Fergusson recommends that the dilatation should be effected very slowly, by means of a metallic or some other dilator, till it is capable of admitting the forefinger, when a forceps may be introduced to seize the stone. If this should not answer, and it seems necessary to make an incision, he recommends that the anterior half of the urethra—not its whole length into the bladder—should be divided to the extent of half an inch with a probe-pointed bistoury; after which sufficient dilatation may be effected with the forefinger oiled. The outer part of the urethra, which is the most undilatable part of it, would be alone divided by this operation, and the neck of the bladder, unless very roughly used, would speedily acquire its tone and use. In this way the eminent surgeon just quoted has extracted a stone three inches in circumference, and the patient had the power of retaining her urine immediately afterwards.*

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* Lithotomy Simplified, by G. Allarton, Lond., 1854; Ranking, vol. xxi.

CHAPTER XXI.

DISEASES OF THE MALE GENITALS.

SECTION I.—DISEASES OF THE PENIS.

I. PHYMOSIS signifies a preternatural constriction of the orifice of the foreskin, so that the glans cannot be uncovered without difficulty, if at all. It may be a congenital affection, or may be caused by the contracted cicatrices of ulcers. Besides the obstruction which it occasions to the functions of the organ, it prevents the washing away of the secretions from the corona glandis, and thus renders the patient liable to frequent *balanitis* and gleets, and in advanced age to epithelioma of the penis; and it is a source of great trouble if he happens to be affected with the venereal disease.

Treatment.†—The surgeon may either *circumcise*, that is, cut off the end of the foreskin, which is advisable if the end is thickened and gristly, or may slit it up. If he circumcises, he should draw out the end of the foreskin, hold it between the blades of forceps, and cut it straight off; after which, with scissors, he should cut up the mucous lining of the foreskin to the corona, so as quite to uncover the glans. If he prefers the slitting plan, a director may be introduced about an inch between the glans and prepuce, and a curved, narrow-pointed bistoury passed along its groove, by which the prepuce may be slit up. Then, after either operation, four or five fine sutures should be passed through the margin of the incision, so as to draw together the edge of the skin and that of the mucous lining of the prepuce, that they may unite by adhesion. If this is not done, the skin and mucous membrane will be separated by the swelling that follows the operation, and the wound, instead of being a mere line, will be half an inch wide. Instead of these operations it is now proposed to make two or three cuts, each about a quarter of an inch deep, through the skin and mucous membrane forming the edge of the prepuce, at equal distances. But the author has seen unsatisfactory results from stingy operations.

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* Fergusson, Practical Surgery, second edition, p. 135.

† The author early this year saw a Cambridge student, æt. 23, affected with congenital phymosis of the tightest kind. He advised him to come up to town in the long vacation to be circumcised; and meanwhile, for the sake of cleanliness, daily to inject warm water under the prepuce. The result was that the orifice spontaneously gave way, and no operation was required.

II. **Paraphymosis** is said to exist when a tight prepuce is pulled back over the glans, constricting it, and causing it to swell.

Treatment.—The surgeon first compresses the glans with the fingers of one hand, so as to squeeze the blood out of it, then pushes it back with that hand, whilst he draws the prepuce forwards with the other. If this fails, the constricting part of the prepuce must be divided with a curved-pointed bistoury.

III. **Cancer of the Penis** is rare. That which is commonly called cancer, is epithelioma, which generally begins as a warty excrescence on the inner surface of the prepuce. It generally occurs to elderly persons, who have had phymosis. The disease, left to itself, follows the ordinary course. After a time ulceration commences. Whilst one part is perishing, fresh warty growths sprout up and invade the rest of the organ; ulceration spreads with its fetid discharge; there is immense irritation with the urine; the morbid growths strike root into the corpora spongiosa; the glands in the groin are affected, and the patient dies miserably.

This disease may be combined with cancer; it may be complicated with syphilis; it may, in its earlier stages, be identical with, or indistinguishable from, vascular warts, or condyloma, if ulcerated. The rule hence deducible is, that free and early extirpation should be performed in all doubtful cases of papillary excrescences, and that if the disease return, the part should be amputated. Statistical results are here impossible without microscopic examination; but the general experience of surgeons may be expressed by the words of Fergusson: "that if certain sores which may be termed pseudo-cancerous were treated by excision at an early date, there would be a better result than surgery can yet boast of;" but that when the disease has obtained a firm footing, a temporary respite is all that amputation can give.

IV. **Amputation of the Penis.**—An assistant steadies and compresses the root of the organ; then the surgeon stretches it out with one hand, and cuts it off with one sweep of a bistoury. Bleeding vessels are now to be tied, and cold to be applied, and after three or four days a piece of bougie is to be introduced into the orifice of the urethra, and to be retained there during the cicatrization.

V. **Epispadias.**—As the hæmapophyses of the foremost vertebra in the cranium, and the soft parts covering them, may be ill developed, leaving the fissures known as cleft-palate and hare-lip, so the corresponding parts of the sacral series, if ill developed, leave fissures in that region. 1. The pubic bones may be imperfect at the symphysis, leaving a gap, completed by ligament. 2. The two sides of the penis may be separated—which the surgeon may attempt to unite, but will hardly succeed. 3. There may be complete absence of the anterior wall of the bladder, and of the upper surface of the penis. This is a horrid case: there is a deep gap at the lower part of the abdomen, from which the red mucous membrane of the bladder protrudes, and the urine is incessantly dribbling. The testicles and scrotum may be well developed. The surgeon may content himself with mechanical appliances for palliating the patient's inconveniences; or he may attempt, if he thinks it prudent, a radical cure, such as that which Mr. Simon devised and executed. This consists in first establishing a fistulous passage from the imperfect bladder into the rectum, and then in closing the edges of the fissure. The results of the operation have not been proportionate to the ingenuity and skill evidenced in its invention and execution.*

VI. HYPOSPADIAS is a deficiency of the parts constituting the under surface of the urethra. It is very common indeed for the last half inch or inch of the urethra to be impervious, there being an orifice about the situation of the frænum; but this requires no treatment. If the gap is so extensive as to interfere with the proper use of the genitals, it may be attempted to be relieved by paring the edges of the skin on each side of the fissure, and uniting it by suture, provided that the urethra is pervious to the end of the penis. An American surgeon has proposed to unite the edges of the fissure by cauterizing them with nitrate of silver, and then scraping off the black eschar; by which means the surfaces are made raw without hæmorrhage or loss of substance.

VII. ELEPHANTIASIS.—The natives of India are liable to this disease in the areolar tissue of the penis and scrotum, which parts become completely buried in the enormous tumours which are developed, and which may weigh possibly 60lb. to 180lb., hanging down to the patient's knees, or even to the ankles. (See p. 120.)

The malady generally begins in the prepuce, from which it spreads and involves the areolar tissue of the scrotum. The skin is wrinkled, and there is a kind of aperture from which the urine escapes. The only remedy is extirpation of the diseased mass, but the penis and testicles should be shelled out and saved if possible.†

For the removal of a tumour so gigantic, the preparations adopted by Indian practitioners are gigantic in proportion. The patient is narcotized by chloroform, or by mesmerizing, which process certainly seems effectually to stupefy the natives of the East, and is placed in the lithotomy position. Two assistants are required to hold the legs; one or two to raise the tumour and hold it up. Sometimes this is done by means of a pulley; and we may observe that before the operator begins, the tumour should be raised and compressed for some time, so as to let every drop of blood possible escape from it into the general circulation. The surgeon must also take care that no hernia is concealed. Then the operation consists first in a longitudinal cut with a long knife up the urinary aperture, over the dorsum of the penis, which part is to be dissected out; next, by similar incisions over each cord and testicle, those parts are exposed, dissected out, and held up: whilst lastly the operator makes a clean sweep with the remainder of the tumour. The great danger is the hæmorrhage; which must be obviated by a rapid operation, and by plenty of ligatures.

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* Mr. Simon's case, Lancet, 1852, vol. ii., p. 568; case by Mr. Lloyd, Lancet, 1851, vol. ii., p. 370.

† Free incisions might, as the writer believes, prevent the necessity of excision.

If the tumour is very large, the attempt to save the testicles, or even the penis, might be hazardous, and a clean sweep must be made.*

SECTION II.—DISEASES OF THE TESTIS.

I. ACUTE INFLAMMATION of the testis (*acute testitis, orchitis, hernia humoralis*) may be caused by local violence, but more frequently occurs in conjunction with gonorrhœa, through an extension of inflammation from the urethra. It is very liable to be induced if the patient indulges in violent exercise and fermented liquors, or neglects to use a suspensory bandage while employing injections.

Symptoms.—The discharge from the urethra diminishes, and the patient soon complains of aching pain in the testis and cord, extending up to the loins, and soon followed by great swelling, excruciating tenderness, fever, and vomiting. The epididymis is the part chiefly affected. The swelling depends chiefly upon an effusion of lymph and serum into the tunica vaginalis.

Treatment.—Absolute rest in bed; the application of numerous leeches, or the abstraction of blood from some of the veins of the scrotum; opium at night to allay pain; purgatives, especially F. 40, followed by tartar emetic in doses of a sixth of a grain, F. 67, every five or six hours, warm fomentations, and a suspensory bandage, or handkerchief, to elevate the part upon the abdomen. After the acute stage has subsided, strong astringent lotions, F. 117, may be employed, and subsequently friction with mercurial ointment, or else a very mild mercurial course, in order to remove the hardness and swelling which (as the patient should always be informed) remain after the acute attack. As soon as the very acute stage has subsided, *compression* will be found a useful means of reducing the swelling, and supporting the dilated vessels. The affected testicle is grasped and separated from its fellow, and then is encircled with strips of adhesive plaster, which are to be applied regularly and as tightly as the patient can bear; the first strap being applied round the spermatic cord immediately above the testicle, and the other downwards in succession, slightly overlapping each other.†

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* Field Notes for Amputations, &c., by Allan Webb, M.D., Calcutta, 1855; Esdaile on Natural and Mesmeric Clairvoyance, Lond., 1852.

† This practice, which was first recommended by Fricke, of Hamburg, was adopted by Ricord, and introduced into this country by Mr. Acton and Mr. Langston Parker. See also T. Blizard Curling on Diseases of the Testis, 2nd edit., Lond., 1856; Cæsar Hawkins, Lond. Med. Gaz., N. S., vol. iv., p. 943.

II. CHRONIC INFLAMMATION (*Sarcocele*) is known by more or less hardness, swelling, tenderness, and occasional pain. Very often it commences in the epididymis. It may be a sequel of acute inflammation, or may be caused by disease in the urethra, which should always be looked for, and treated if found. It sometimes depends on a syphilitic taint, which will be probable, if the patient has the aspect of secondary syphilis, if the pain is principally severe at night, and if there are secondary venereal affections of other parts; chronic rheumatism is often a cause. It very often, in its latter stages, is accompanied with some degree of effusion into the tunica vaginalis (*hydro-sarcocele*). It may be distinguished from cancer by the distinction between testis and epididymis not being lost; by its often affecting both testes; by the greater uniformity and smoothness of the swelling, its slower progress, and the absence of glandular enlargement in the groin. As it increases, the tumour softens in parts, thus again presenting similarity to cancer; but when it softens it is not so large as soft cancer would be. On examination, the testicle is found to contain a yellow exudation, which is both interspersed in its substance, and also, according to Sir B. Brodie and Mr. Curling, is deposited into the tubuli seminiferi, and may be found extending into the vas deferens.

Treatment.—So far as regards the part—rest; a suspensory bandage; occasional leeching; or cold lotion; or iodine paint; or blisters; or Scott's ointment, with pressure by strips of plaster. The constitutional treatment requires care and discrimination. In some uncomplicated, and in some syphilitic cases, it is expedient to administer mercury very gently; in other cases, corrosive sublimate with bark or sarsaparilla, the iodide of potassium, cod-liver oil, nourishing diet and tonics.

III. ABSCESS of the testis may be a result of chronic or scrofulous inflammation—very rarely of the acute. A puncture should be made so soon as fluctuation is clearly felt, and the skin is adherent. And when the matter has been evacuated, the case should be treated by pressure, and in other respects like any other abscess.

IV. FUNGUS, or HERNIA TESTIS. When the fibrous tissue of the testis has been perforated by abscess, a soft fungus, composed of the tubuli, and of fibro-plastic matter, is apt to protrude. This should be returned to its place by pressure with lint and strips of plaster; bichloride of mercury or iodide of potassium with tonics may be given to excite absorption of interstitial lymph if there is a syphilitic or scrofulous taint: and stimulating applications, such as the lunar caustic, should be used in order to excite granulation. Should this fail, Mr. Syme's operation should be resorted to, of making two semi-elliptical incisions ( ), one on either side of the fungus, removing the narrow edge of skin around the fungus, and then bringing the healthy skin from either side over it, and employing sutures and other measures for procuring adhesion. To shave off the protruding substance would be almost equal to castration.

V. SCROFULOUS INFLAMMMATION commences with a deposit of tubercle into some part of the testis or epididymis, either into or between the tubuli. A nodular swelling appears externally, attended with very little pain or tenderness, which after a time inflames and bursts, and gives exit to the fungous protrusion just mentioned. It often happens that the lungs are tubercular as well. *Treatment.*—The health must be invigorated by cod-liver oil, bark, the iodides of iron and potassium, lotions of zinc, iodine, &c. (See p. 88.) When all the tubercular matter has been evacuated, the abscess heals of itself; but, before this occurs, the whole organ is often disorganised and rendered useless, and sometimes it is necessary to remove it, on account of the irritation and drain on the system.

VI. ATROPHY of the testicle may be a result of excessive venereal indulgence, or of injury or of inflammation; the part becoming filled with exudation, which degenerates, and in so doing annihilates the tubular structure, and is then itself absorbed. The gland may dwindle to the size of a pea. There is no cure.

VII. IMPERFECT DESCENT OF THE TESTICLE.—This organ may either remain in the abdomen permanently, or may be stopped in the inguinal canal. The latter condition renders it extremely subject to pain and injury, and renders the patient liable to hernia. In order to prevent these evils, Mr. Curling recommends, that if the testis has not quitted the abdomen by the time the child is a year old, a truss should be applied to prevent it from coming down at all. When a testicle not fully come down, is complicated with hernia, an endeavour must be made to keep up the hernia by a small pad, which will keep the testis down. In cases, in which the testicle in this situation is mistaken for hernia, the absence of it from the scrotum, the peculiar pain felt on handling it, the peculiar consistence of the swelling, and the absence of impulse on coughing, are the chief diagnostic marks.* (See p. 528.)

VIII. NEURALGIA of the testis and cord, produces fits of excruciating pain, which leave the parts tender and slightly swollen. The *treatment* must be that of neuralgia generally. (See p. 330.) Violent purgatives in general do mischief. A few leeches, the application of intense cold, counter-irritants, and opiate or belladonna plasters or liniments, sometimes afford relief. The internal remedies most likely to do good are steel, quinine, and other tonics. Extreme sensitiveness of the testis, so that it cannot bear the slightest touch—the representative of the irritable uterus and ovaries—is another form of this disorder sometimes met with in nervous hypochondriacal subjects; especially in persons who labour under a diseased condition of the urethra, or excessive spermatic discharges. Tonics and cold applications may be tried and the cause of the affection should be ascertained, and if possible removed. In these cases the patients often desire to be castrated. But the surgeon is not justified in doing so, unless there is positive disease. For a surgeon to remove healthy testicles for epilepsy, or neuralgia, or monomania, is an abominable act, which deserves to be punished according to the Mosaic law, "An eye for an eye, and a tooth for a tooth."

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* See T. Blizard Curling, op. cit., 2nd edit., 1856.

IX. **Hydrocele** signifies a collection of serum in the tunica vaginalis.

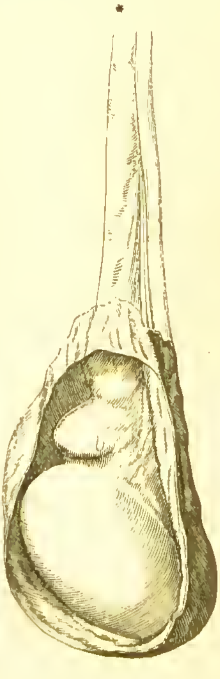
Symptoms.—It forms a pear-shaped swelling, smooth on its surface, fluctuating if pressed, free from pain and tenderness, and causing merely a little uneasiness by its weight. The epididymis can be felt on the posterior surface of the tumour near the bottom. On placing a lighted candle on one side of the scrotum, the light can be discerned through it.

Causes.—Hydrocele may be a sequel of inflammation of the testis, but more frequently arises without any local cause. It is often supposed to follow strains of the loins or belly.

Diagnosis.—Solid enlargements of the testis may be distinguished from hydrocele by their weight, solidity, and greater painfulness, and by the absence of fluctuation or transparency. The diagnosis from hernia will be found at p. 527.

Varieties.—It sometimes happens that the tunica vaginalis preserves its communication with the abdomen, and then becomes filled with serum, forming a cylindrical tumour, extending up to the abdominal ring, to which the name *congenital hydrocele* is applied. On raising and compressing it, the fluid is slowly squeezed into the abdomen, and slowly trickles down again afterwards. This case is liable to be complicated with a *congenital* or *encysted hernia*, to prevent which, and to close the communication with the cavity of the peritonæum, a truss should be worn. Sometimes the transparency and fluctuation of hydrocele are absent in consequence of a thickening of the tunica vaginalis, which may be known, according to Brodie, by noticing that the thickened membrane forms a projection along the epididymis, whereas in solid enlargements of the testicle the projection of the epididymis is lost. Sometimes the tunica vaginalis is partially adherent to the testicle. Sometimes loose cartilages are found in the sac; they are easily removed by a slight incision.

Treatment.—The remedies for hydrocele are threefold. 1. Strong discutient lotions (F. 118, &c.), which sometimes assist the cure in children, but cannot be depended on for adults. 2. Evacuation



* Hydrocele. From King's College Museum.

of the serum, or the *palliative cure.* This may be accomplished by a puncture with a common lancet, or trocar; but the method most commonly adopted at present, consists in making a number of punctures with a grooved needle, so that the fluid may escape from the tunica vaginalis into the cellular tissue of the scrotum whence it is readily absorbed. This *palliative treatment* is always sufficient for children, but very rarely so in the case of adults.

3. *Radical Cure.*—This is performed by injecting certain stimulating fluids, or by introducing setons or other foreign substances into the tunica vaginalis, in order to excite a degree of inflammation sufficient to destroy its secreting faculty. It must not be forgotten, however, that this *radical cure* is totally inadmissible if the testis is diseased, or if the hydrocele is complicated with an irreducible hernia, or if the tunica vaginalis preserves its communication with the abdomen. Mere thickening from *previous* disease is, however, no objection.

Operation.—The surgeon grasps the tumour behind, and plunges a trocar and canula into the sac, pointing the instrument upwards, so that it may not wound the testicle. He next withdraws the trocar, at the same time pushing the canula well into the sac. Then, the old plan was to inject three or four ounces of some irritating liquid, such as port wine or zinc lotion, through the canula, by means of an elastic bottle fitted with a stop-cock, to let it remain a few minutes, and then let it run out, and withdraw the canula. But the remedy most in favour at present is the *tincture of iodine,* which was used with very great success at Calcutta, by Mr. Martin. The disease is so common in the East, that Mr. Martin can refer to thousands of successful cases. The sac having been punctured with a small trocar and canula, about one or two drachms of a mixture of one part tincture of iodine, and two of water are injected and *allowed to remain in the sac.* Mr. Fergusson uses for this purpose a small glass syringe, with a silver or platinum nozzle made to fit the canula. Mr. Curling recommends palladium. One advantage this method certainly has—namely, that there is much less chance of extravasation into the scrotum, than when the sac is filled with many ounces of fluid. Some amount of pain, inflammation, and effusion may be expected to follow; and when they subside, the part generally secretes no longer. If it does, the operation must be repeated; or one of the older plans, such as a few threads passed through the sac, by way of seton, or an iron wire as proposed by Dr. Simpson, may be tried.

X. ENCYSTED HYDROCELE.—Sometimes a serous cyst is developed on or near the testis. Most frequently it is situated between the tunica vaginalis and epididymis; very rarely between the tunica vaginalis and testis, and more rarely still within the substance of the external layer of that tunic; sometimes in the spermatic cord. These cysts contain a clear liquid, in which spermatozoa have been found; owing, as Mr. Curling has shown, to accidental rupture of one of the ducts of the gland. They may be punctured with a grooved needle to let the fluid escape, if they have become of inconvenient bulk; and if it is necessary to adopt some radical method of cure, the best plan seems to be to pass a thread or two through the sac with a curved needle, and retain it till it has caused some inflammation.

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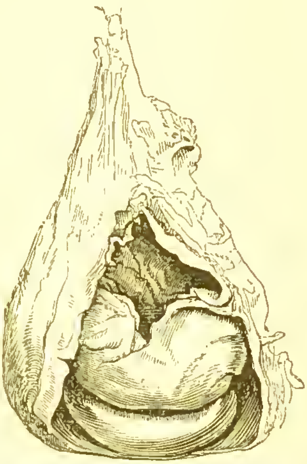

XI. HÆMATOCELE signifies an extravasation of blood into the tunica vaginalis, in consequence of injury. It is sometimes combined with ecchymosis of the scrotum:

Treatment.—In the first place, time, rest, moderate purgatives, and cold lotions, must be employed to prevent or allay inflammation, and allow the blood to be absorbed. Should great inflammation and tense swelling threaten suppuration, an incision should be made. But sometimes the long presence of unabsorbed blood leads to more serious ill consequences. A ponderous tumour is formed consisting of the expanded tunica vaginalis, lined with clot, and filled with sanguinolent serum. If tapped, it probably fills again. For this case, the only thing to be done is to make a free incision, turn out the clot, and leave the cavity to granulate. But if, from the magnitude of the tumour, it is evident that the risk of this operation, and of the sloughing that may follow is too great—and if, as probably happens, the testicle itself is wasted by the continued compression—the only remedy remaining is extirpation.†

XII. VARICOCELE (*Cirsocele* or *Spermatocele*) signifies a varicose state of the veins of the spermatic cord. It is caused by the ordinary causes of varix; that is to say, weakness of structure combined with obstruction to the return of blood through corpulence, constipation, and the like. It is much more common on the left side than on the right; the traditional explanation of which is, that the left spermatic vein is more pressed upon by fæcal accumulations, and that its course is longer and more circuitous than that of the right vein.

Treatment.—In ordinary cases, sufficient relief may be obtained by keeping the bowels thoroughly open; by frequently washing the scrotum with cold water or astringent lotions, so as to constringe the skin; and by supporting it with a suspensory bandage, made of good stout *jean*, braced firmly up to a band passing round the pelvis. But there are some cases in which this disease produces very serious inconvenience—pain in the scrotum and loins—sense of dragging at the stomach—loss of appetite—flatulence—and despondency of mind—and for these cases, something more must be done. Mr. Wormald recommends the loose skin of the scrotum to be pinched up and confined with a steel ring. Blisters and counter-irritants, so as to inflame and condense the scrotum; division of the veins by the knife or caustic, and passing setons of thread through them, have had their advocates; and even the barbarous operation of passing a ligature through the scrotum, and tying up the skin of half the scrotum, with all the vessels except the artery and vas deferens—so that they may be divided by ulceration—has been practised in some cases with success; in others with fatal results; but certainly always with a risk of causing atrophy of the testis. A more humane method is that of passing the ligatures subcutaneously, so as to divide veins only and not skin. These operations on the veins are always attended with risk. Sir A. Cooper proposed the operation of cutting away a good piece of the loose relaxed skin. "The manner of performing it is as follows:—The patient being placed in the recumbent posture, the relaxed scrotum is drawn between the fingers; the testis is to be raised to the ring by an assistant; and then the portion of the scrotum is to be removed by the knife." Any artery requiring it must be tied; and cold must be applied to check bleeding; and then the lower flap of the scrotum must be brought upwards and forwards, and be attached by sutures to the fore and upper part; and a suspensory bag should be applied to press the testis upwards, and glue the scrotum to its surface.

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* Encysted hydrocele. From a preparation in the Middlesex Hospital Museum.

† See case by Bowman, Lancet, 1853, vol. i., p. 177.

But the method which appears most promising at present, consists in the application of moderate pressure to the dilated veins at the external abdominal ring, by means of Evans's patent lever truss; so as to release them from the pressure of the superincumbent column of blood, and afford them a moderate degree of support.*

XIII. Morbid Growths.—The testicle is liable to almost every variety of morbid growth. Thus the *fibrous* and fibro-plastic tumours may be developed within it; cysts of various kinds (forming the *hydatid disease* of Sir A. Cooper), of which probably the origin is, according to Mr. Curling, to be found in dilated tubules of the rete testis, and which may accompany cancer, and other growths that are not cancer;—and *enchondroma*, which seems to have a peculiar predilection for the testicle, and may be found here in connexion with many other kinds of morbid growth. It may be developed within the tubules, or within the lymphatics.† The diagnosis of these growths is chiefly concerned in proving, first, that they are not inflammatory, nor syphilitic on the one hand, which is show nby their resisting all treatment; and secondly, that they are not cancerous, which is shown by their slowness of increase, and by the absence of cachexia. If the tumour becomes of unsightly magnitude, it should be extirpated.

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* See Sir A. Cooper, Guy's Hosp. Rep., vol. iii.; Reynaud, Journ. des Connaissances Méd., Feb. 1839; James in Prov. Med. Trans. for 1840, and Curling. op. cit. The diagnosis of Varicocele has been spoken of at p. 528.

† See Jabez Hogg, Path. Trans., vol. iv.; Curling, Med. Chir. Trans., vol. xxxvi., and Path. Trans., vol. vi.; and especially Mr. Paget's account of a case of enchondroma of the testicle, Med. Chir. Trans., vol. xxxviii. The testis was cut out, and the patient perished of an extension of the disease up to the lumbar glands, into the ascending cava, and throughout both lungs.

XIV. CANCER of the testis is almost always of the soft variety; it may be combined with enchondroma, or with cystic growth. At first the gland swells, and becomes very hard and heavy; it is scarcely, if at all, painful or tender, and merely causes slight aching in the loins by its weight. After a time it enlarges rapidly and feels soft, the cord swells, there are occasional darting pains, the lumbar glands become affected, and cachexia and death soon follow in the ordinary course.

Treatment.—When the patient first applies, it will be right, if the diagnosis is undecided, to treat the case as if fibro-plastic or syphilitic, by the administration of iodide of potassium. But if the disease is proved to be cancer, and there is as yet no invasion of the lumbar glands, nor marked cachexy, extirpation may afford the patient a few months of life less burdened by pain and disease.

XV. CASTRATION is performed thus:—the scrotum being shaved, the surgeon grasps it behind to stretch the skin, and makes an incision into the tunica vaginalis, to examine the testis, if there is any doubt in the diagnosis. If there is none, he extends the cut from the external abdominal ring to the very bottom of the scrotum. If the skin is adherent, or diseased, or if the tumour is very large, two elliptical incisions may be made, so as to remove a portion of skin between them. Then he separates the cord from its attachments, and an assistant holds it between his finger and thumb, to prevent it from retracting when divided. He now passes his bistoury behind the cord, and divides it; and seizing the lower portion draws it forward and dissects out the testicle. The arteries of the cord, and any others requiring it, are then to be tied; and the wound must not be closed till all the bleeding has ceased, as this operation is often followed by secondary hæmorrhage.

SECTION III.—DISEASES OF THE SCROTUM.

I. ŒDEMA OF THE SCROTUM.—The loose cellular tissue of this part is liable to immense distension from dropsy. Punctures with a sewing-needle will relieve it. If great and tense œdema, from erysipelas or low inflammation, should threaten sloughing, a free incision should be made.* The latter case very much resembles extravasation of urine, but may be distinguished by the absence of swelling in the perinæum, and of obstruction in micturition.

II. CANCER SCROTI.—This disease is commonly called the *Chimney-sweeper's Cancer*, because it is said to be seldom met with except amongst that class of men, and because the irritation of soot is said to be the cause of it. Some other irritants are believed to have the same effect on the scrotum. Thus, it is stated on the authority of Dr. Paris, that smelters are liable to a similar disease. And on the other hand, it is said that soot may produce this disease on other parts beside the scrotum. The etiology and anatomy of the disease, however, require further investigation.

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* Liston on Acute Œdema of the Scrotum, Med. Chir. Trans., vol. xxii.

It usually commences as a florid vascular wart, called the *soot-wart*. This gradually spreads, affects the whole scrotum and neighbouring parts of the penis, and ulcerates, producing a fungous sore with ragged edges, discharging a thin offensive matter, and causing so much pain and constitutional disturbance as ultimately to destroy life.

This disease is probably, in general, epithelioma, sometimes cancer; in either case, free and early excision should be adopted, as we have often before said.*

SECTION IV.—IMPOTENCE AND SYPHILOPHOBIA.

IMPOTENCE in the male may depend on a variety of conditions. 1. It may be caused by absence, or mutilation, or malformation, or original weakness and want of development of the genital organs. 2. After any severe illness, the genitals may remain incapable of performing their functions, long after the restoration of the health and strength in other respects. Steel and other tonics, with cascarilla, musk, nux vomica, Indian hemp, galvanism cautiously applied to the spine, spices, eggs, and oysters, and above all, *time*, and abstinence from attempts at connexion till the strength is fully restored, are the remedies. Phosphorus, F. 191, is said to be a potent *aphrodisiac*. 3. Blows on the head, or spine, are apt to be followed by impotence; which sometimes is relieved, but more frequently is permanent. A cautious course of mercury, followed by the stimulating aphrodisiacs just mentioned, are the remedies most likely to be of use. A similar result sometimes follows a fit of apoplexy. 4. Certain diseases are always attended with a diminution, and sometimes with a complete loss of sexual power; especially diabetes, diseases of the kidneys, some forms of dyspepsia, and the latter stages of most chronic organic diseases. 5. It sometimes happens that a young man, the first time he yields to carnal temptation—or that a newly-married man on the night of his nuptials, finds himself incapable of accomplishing his wishes—through awkwardness, or timidity, or over-anxiety, or, perhaps, because on nearer inspection he finds his *chère amie* less tempting than she seemed, or because the consciousness of guilt prevails over the sense of desire. He straightway fancies himself impotent. The surgeon should cheer his spirits, and should inform him that his case is by no means uncommon—he should advise him, if married, to banish his fears; if single, to wait till he can gratify his passions legitimately in marriage.

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* See Walshe on Cancer; Hughes Bennett on Cancer, p. 126; Lebert sur le Cancer, p. 674; Hannover on Epithelioma, p. 141. Paget's Lectures, vol. ii.

There is a very frequent and distressing class of cases, in which the patients, generally young men of good education and refined feelings, and with vigorous development of the genital organs, believe themselves to be impotent, or to have spermatorrhœa; or perhaps to be labouring under secondary syphilis; a state designated *Syphilophobia.* These cases require very skilful and kind treatment. The malady is in reality mental; caused often by the struggle between natural passion and religious sentiment, and aggravated usually by some disorder of bodily health, such as oxaluria, or other form of poisoned blood. If the surgeon foolishly makes light of the case, or if he still more foolishly tries to argue the patient out of his malady, the patient immediately flies to the advertising quacks, to the great detriment of mind, body, and estate. The proper course to pursue is, to improve the general health. The writer has cured many an inveterate case of imagined impotence or syphilis by a few grain doses of calomel, followed by combinations of quinine with Epsom salts, and afterwards steel or zinc.

Lastly, impotence may be produced by premature and excessive venery, or by the practice of self-pollution. Such cases not unfrequently come under the observation of the London practitioner. The sexual organs have been rendered so weak and irritable, that the least excitement from a lascivious idea or from the mere friction of the clothes, brings on an imperfect erection, followed immediately by the discharge of a thin fluid. The erection is so imperfect, and followed so soon by the discharge, that the patient is incompetent for sexual connexion; and the frequent and abundant losses of seminal fluid (whence the term *spermatorrhœa* is given to this malady), together with the patient's consciousness of his own imperfection, bring on a most miserable state of bodily weakness and mental despondency. General tonics, and cold-shower-bathing, will do something to relieve this state; but the most essential thing is, the observance of *perfect chastity* of idea, so that all excitement may be avoided. The prostatic portion of the urethra, in these cases, is often preternaturally irritable and sensitive; and this condition of the parts at the orifice of the seminal ducts tends greatly to keep up the excessive secretion, and to promote the action by which it is expelled. It is a very important indication, therefore, to attack this irritable surface, destroy its sensitiveness, and so interrupt the chain of morbid phenomena.

The author has found great benefit from the use of enemata of cold water at bedtime; cold or tepid salt hip-baths; F. 72, 38, 21, 181, and opiate suppositories. He has seen cases in which a preternatural irritability of the ejaculatory apparatus, with involuntary nocturnal emissions, even of a bloody fluid, together with very great pain in the back, languor, and despondency of mind, have been caused by the presence of irritating urine, containing oxalate of lime, and cured by the means described in the section on Urinary Deposits. Lastly, there is the application of nitrate of silver to the prostatic portion of the urethra, as directed at p. 567; of which it may be said, that if sometimes useful, it is often useless, if not mischievous. Any tampering with, and every means of directing the patient's thoughts to, the genital organs, should be avoided if possible.

CHAPTER XXII.

SURGICAL DISEASES OF THE FEMALE GENITALS.

I. Catarrhal Vulvitis.—Women—even young girls—are subject to mucous or purulent discharges from the parts at the entrance of the vagina; which may also perhaps be excoriated. Purgatives, tonics, soap and water, and astringent lotions are the remedies. (See p. 182.)

II. Noma signifies a phagedænic affection of the labia pudendi of young female children, precisely resembling the *cancrum oris*, p. 437, in its causes, and nature, and symptoms. After two or three days of low fever, the little patient is observed to suffer considerably whilst making water, and on examination, the labia present a livid erysipelatous redness and vesications, that are rapidly followed by phagedænic ulcers. This disease is very frequently fatal. The treatment is the same as directed for cancrum oris. The surgeon must be very careful not to mistake this or the preceding affection for venereal disease; an error common enough among parents. In the year 1853 there were several criminal trials at Dublin of persons falsely accused of tampering with children.*

III. Vesico-Vagina Fistula signifies a communication between the bladder and the vagina. It generally results from sloughing of the parts after a tedious labour.† As soon as it is discovered, the patient should be made to lie on her face; the utmost cleanliness should be enforced by means of astringent injections and fomentations; by which means the cicatrization and contraction of the aperture will be promoted. When the spontaneous processes of cure are carried so far as can be, art must step in.

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* Kinder Wood on a fatal affection of the Pudenda of Female Children, Med. Chir. Trans., vol. vii., p. 84. Wilde, Med. Times, Oct. 1853.

† With the improvement of midwifery, and with less cowardice and delay in resorting to the forceps, this accident ought to disappear. Midwifery lecturers are to blame for the absurd overcaution which they inculcate with regard to the forceps. It is, by-the-by, curious to remark, that out of nineteen cases related in Remarks on the Urethro-Vaginal, and Vesico-Vagiral Fistules, by N. Bozeman, M.D., of Montgomery, Ala., 1857, fourteen occurred in *coloured girls*, or negresses.

The application of a cautery at a black heat to the edges of the fissure, at intervals of from ten to thirty days, so as to get them not to slough but to contract, is much used, and with very excellent results, by Dr. Arthur Farre, both in the vesico- and recto-vaginal fistulæ and in lacerations of the perinæum; and the writer has seen it used with excellent effect in a case of recto-vesical fistula by Dr. Tanner.

But in such cases an operation should be performed as follows:—The patient, gently chloroformed, must be comfortably supported, leaning forward, on her knees, with the chest at a lower level than the abdomen; but if preferred she may be in the lithotomy position; then, whilst an assistant on either side separates the labia and keeps the rectum out of the way by finger or bent spoon-handle, the operator, by means of forceps or hook and long narrow knife, entirely and thoroughly denudes or *vivifies*, as the French say, the edges of the aperture, especially at each extremity. Too much care cannot be taken in this respect. Then sutures are to be passed; and the best suture is of fine silver wire. These may be passed by means of a needle with a fish-hook curve, which the writer devised for the purpose, first through

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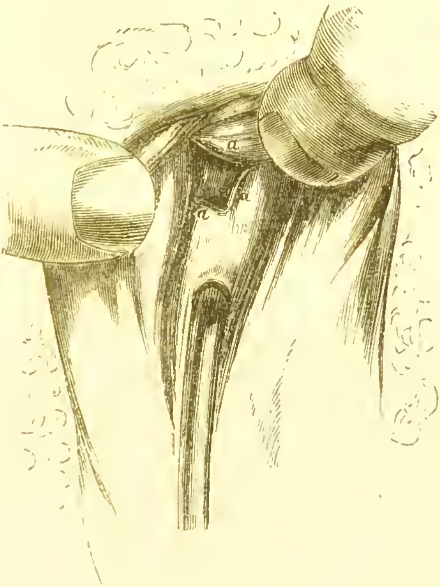

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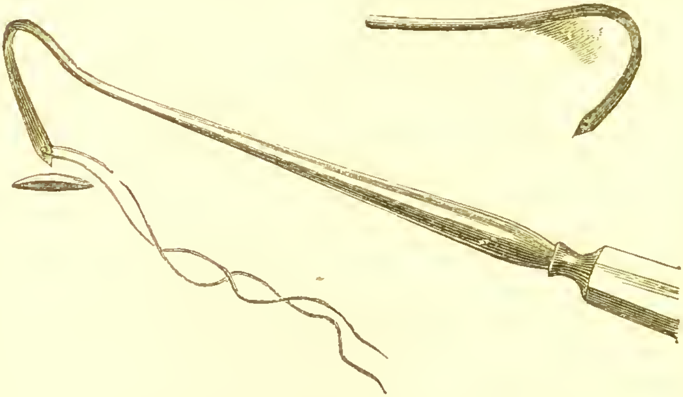
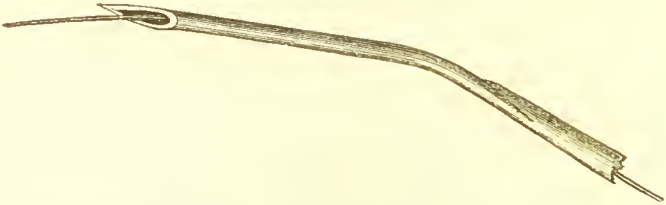
* Vesico-vaginal fistula. Sketch of a patient in the position described in the text, with a catheter in the bladder; *a*, edge of fistula.

the farther, then through the nearer edge; the needle being so curved that it can be introduced and withdrawn without wounding the vagina, and so that the operator's hand does not get in the way of his eyes.

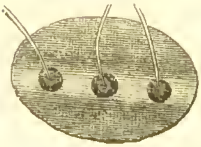


When a sufficient number have been passed, their ends may be passed through a bar of white metal, drilled with holes; one bar on the farther the other on the nearer side of the fissure, so as to act as quill sutures; the ends of the wires to be secured by split shot, pushed on the wires close up to the bar, then pinched by forceps to make them bite the wires. This is Dr. Marion Sims's plan.

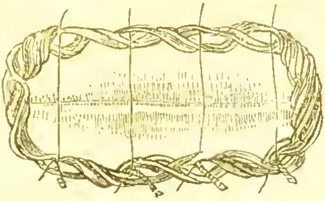
A better needle, however, is the hollow one represented here, described by Dr. Simpson, and said to have been devised by Mr. Startin.



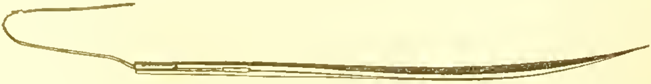
Other modes of securing the wire sutures, are—the *metallic button* of Dr. Bozeman, a plate of lead adapted in size and curvature to fit the spot; and perforated with holes through which each pair of ligatures is drawn, and then fixed with split shot. This apparatus insures great fixity of the parts, and its use has been attended with great success. Instead of using a shot the wires may be twisted.



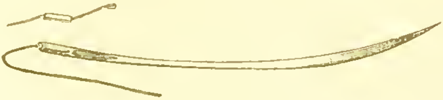
Dr. Simpson has devised a wire splint, to hold the margins, or rather the whole site of the wound steadily, and to hold the sutures. It is made by twisting fifteen or twenty strands of fine iron thread into a cord; the ends of which are plaited together in a circle, which may be moulded so as to surround the wound. A sufficient number of apertures is made with a common borer, to allow the sutures to pass. The above figure shows it applied.*



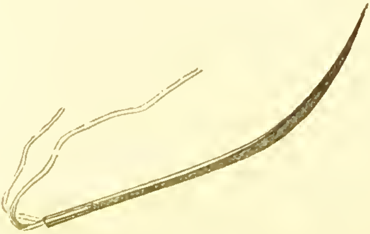
The annexed engravings represent needles adapted for wire sutures in these or any other operations. Mr. Price's has two holes, about half an inch apart, and the upper and under surfaces grooved; wire passed from hole below to that above; end of wire doubled to hold it.



Mr. Murray's has a groove and open box end.



Mr. Lister's, one hole; the side grooved.



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* Copied from Dr. Simpson's Lecture in Med. Times and Gaz., Jan. 8th, 1859. Dr. Simpson prefers the common blue annealed iron wire, No. 32. The best is manufactured by Cockers, of Sheffield.

After the operation, a short metallic catheter, curved like S, communicating with an ox-gut or elastic urinal, should be retained in the bladder, so that no urine may accumulate there. The patient should lie on one side, turning rather over towards the face; cold water be occasionally injected into the vagina; opium be given in the dose of a grain at bed-time, and another once or twice more in the day; and the wound should not be examined, nor the sutures be disturbed, nor the bowels be opened, till the fifth or sixth day. Opium is most necessary: in one case, spite of it, the author was foiled by spasm of the bladder, which drove out the catheter, and sent urine gushing through the wound.

To provide for cases in which there is extensive loss of substance, M. Jobert de Lamballe detaches the vagina from its attachment to the anterior part of the neck of the womb, and so draws it down that there may be no strain on the stitches.*

IV. RECTO-VAGINAL FISTULA must be treated at first by cleanliness and mild laxatives. If after a time the aperture does not close, it must be treated as in the last case.

V. LACERATION OF PERINÆUM during labour, if up to, but not through the anus, and if the patient when passing her water turn upon her hands and knees and uses extreme cleanliness, will generally heal, so as to give little or no subsequent inconvenience. Yet it would be better, *immediately* after labour, to close it by quill suture. *Complete laceration of the perinæum into the anus* is attended with distressing incontinence of fæces, and is prevented from healing by the action of the sphincter. Hence it is necessary to divide the sphincter on each side of the laceration, then to sew together the edges of the laceration, and to prevent the new wounds from uniting, by placing a few threads of lint in them, until the laceration has united. If possible it should be done at once; if not, the operation must be delayed till the lochia have entirely ceased. Then the patient being chloroformed, and placed in the lithotomy position, the opposite surfaces of the lacerated parts and of the lower part of the vagina between must be freely denuded of mucous membrane. Hæmorrhage must be checked by iced water, or if necessary by ligatures; then the parts are to be brought together by the quill suture. Three good-sized ligatures should be passed quite deeply through the tissues, and be attached to a piece of bougie on either side, and the edges of the skin be brought together by two or three interrupted sutures. Then the finger being introduced into the anus, and a straight probe-pointed bistoury by its side, the sphincter should be divided. The catheter must be retained after the operation, to prevent the contact of urine with the wound, opium be freely given, and the bowels kept confined for four or five days.†

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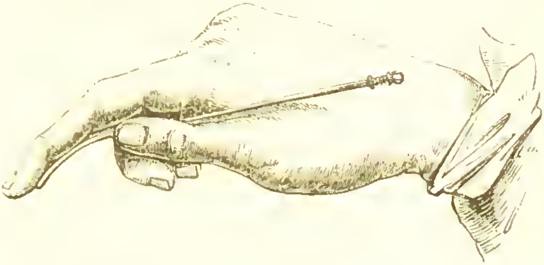
* See some observations by R. Druitt, Lancet, 1852, vol. ii., p 576. Marion Sims, quoted in Ranking, vol. xv. Jobert de Lamballe, Gaz. des Hôp., Oct. 16, 1849. Traité des Fistules Vesico-uterines, &c., Paris, 1852.

† The plan of dividing the sphincter was proposed by Horner: the necessity of opium by Davidson: all the essentials of the operation are summed up by I. B. Brown, in his work on Diseases of Women, Lond. 1854.

VI. THE CATHETER may be easily introduced into the female urethra with one hand, thus:—The surgeon holding it like a pen, but with its point on the tip of the forefinger, passes the forefinger between the labia, and feels for the meatus. The catheter is then easily slipped into the orifice. Either hand may be used, according to the patient's position in bed.



VII. A VASCULAR EXCRESCENCE, varying in size from a large pin's head to that of a horse-bean, is liable to grow from the female urethra, causing great distress through its exquisite sensibility. It should be cut off, and the potassa fusa be applied to the surface to prevent its reproduction. But, immediately after the caustic, a sponge dipped in diluted vinegar should be applied, in order to prevent injury to the surrounding sound parts; and if it is necessary to introduce the caustic within the urethra, it must be by means of a tube which has an aperture in it corresponding to the diseased surface.

VIII. IMPERFORATE HYMEN.—Sometimes this membrane completely obstructs the vagina, and causes the menstrual fluid to accumulate and distend the uterus. The impediment is easily got rid of by a crucial incision. Then all the black treacly fluid that has accumulated should be immediately syringed out with warm water, otherwise it might putrefy, and cause typhoid fever and death. The abdomen should be bandaged, and the patient be confined to her bed till the uterus has resumed its healthy size.

IX. THE LABIA may be the seat of acute inflammation, and of encysted tumours, which perhaps may be connected with the round ligament; of hernia, and of fibrous or fatty tumours. The treatment of these cases requires no distinct comments. The clitoris and nymphæ, if they grow to an inconvenient size, should be curtailed by incision.

X. VARICOCELE.—Enlargement of the veins of the labia, forming a soft tumour, which enlarges when the patient rises, and increases so as to form a most painful impediment to exercise, but disappears when she lies down. *Treatment.*—Cold bathing, and support by a firm truss, or T bandage with a pad.

XI. PROLAPSE OF THE VAGINA is a consequence of structural debility, and is liable to follow parturition, and to accompany and aggravat congestive diseases of the womb. When the posterior wall prolapses, bringing with it the rectum, there is great distress and difficulty in getting rid of the motions; when the anterior wall with the bladder prolapses, there is a great irritability of the bladder; difficulty of emptying it; decomposition of residual urine, and other ill consequences. Cold astringent injections; tonics; baths of alum water, and firm perinæal bandage (see *Bandages*) are the first set of remedies. Should these fail, it may be necessary to resort to a pessary—a thing which no one, however, should use if he can help it. Lastly, there is the ingenious operation of I. B. Brown, which consists of two parts; first, in contracting the circumference of the vagina; secondly, in uniting the posterior portions of the labia, so as to bring forward the perinæum, as it were, to act as a natural cushion and support to the prolapsed parts. The first object is accomplished by denuding a longitudinal slip each side of the vagina, bringing the cut surfaces together longitudinally, and uniting them by suture; the second, by denuding and uniting the inner surfaces of the posterior halves of the labia, as in the operation for ruptured perinæum.

XII. CANCER OF THE VULVA; fungoid bleeding projection, or scirrhous thickening leading to deep and rapid ulceration, with adherent and hard base; must be treated as directed at p. 117.

XIII. CORRODING ULCER, EPITHÉLIOMA, ELEPHANTIASIS, ESTHIOMÉNE of Huguier. The external female genitals are liable to various kinds of enlargements and of ulceration, whose nature and alliances require even yet to be further studied. 1. There is the *superficial lupus* (p. 75), affecting the young and scrofulous; puffy congestive swelling, and infiltration of the skin in soft tubercles; ulcerating in one direction, healing in another. 2. The *corroding ulcer*, or (*esthiomène perforant*, p. 76) a deep glassy ulcer; base slightly infiltrated, burrowing up by side of vagina; distinguished from pure syphilitic ulcers by its rebelliou to anti-syphilitic treatment, and by its not being followed by secondary symptoms. 3. *Elephantiasis: enlargement* of the labia and other external parts (well described by Egan); rendering them a huge, warty, fissured, and most cumbrous mass; consisting in great hypertrophy of the fibrous dermis, in infiltration of fibro-plastic matter, and, as the author believes, sometimes superadded epithelioma. 4. A combination of corroding ulceration, with hypertrophy in various forms; thickened cutis, warty excrescences, and soft tubercles. Of these various instances of disease, many owe their origin to the combined forces of filth, gonorrhœa, syphilis, and scrofula or some other kind of cachexia. The treatment must consist of, 1, cleanliness and astringents; 2, anti-scrofulous, or anti-syphilitic remedies, according to circumstances; 3, these failing, excision of the diseased parts; either at one *coup*, or at several, according to their extent; and the destruction of corroding ulcers by the actual or some other efficient cautery.*

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* See Egan on Syphilis, p. 146; Huguier sur l'Esthiomène; Mém. de l'Acad. de Méd., 1849; Lebert, Hannover, Paget, op. cit.

CHAPTER XXIII.

DISEASES OF THE BREAST.

I. Hypertrophy of the breasts to an enormous size is very common during the earlier months of pregnancy in plethoric women. Aperients will assist time in effecting a perfect cure. In unmarried women the same thing sometimes happens; the breasts becoming so large as to be a perfect burden. If there are any remedies they are the preparations of iodine, and the various means for insuring the healthy action of the womb.

II. Boys and Girls about the age of puberty are subject to slight swelling and tenderness of the breast, which soon disappears of itself if not interfered with.

III. Lacteal Tumour.—Sometimes a lacteal duct becomes obliterated, and the milk accumulates in it, forming an oblong fluctuating tumour near the nipple. If this is punctured, milk will continue to be

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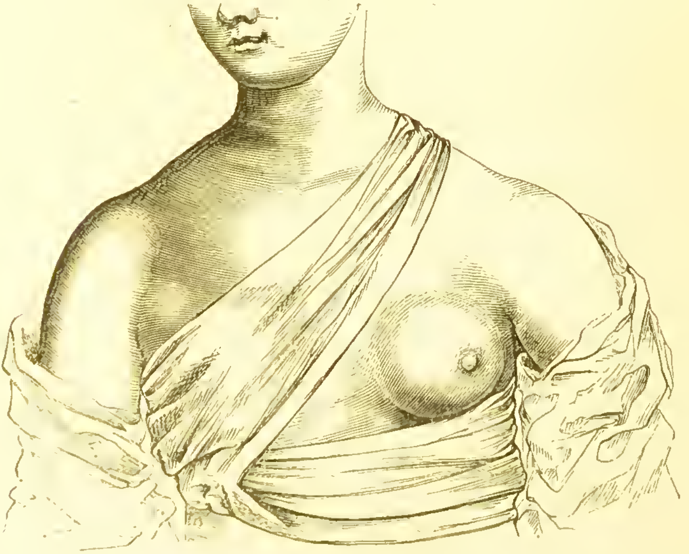

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* This cut shows a very convenient mode of bandaging the breast. The bandage consists of a piece of linen split into two tails, of which one is fastened round the waist, whilst the other supports the breast, passes over the opposite shoulder, and is fixed to the first, behind.

discharged during lactation, and, after the child is weaned, it will dry up and heal. In a few very rare instances there has been formed a

IV. LACTEAL CALCULUS.—The fluid part of the milk in an obstructed lacteal duct having been absorbed, whilst its more solid and earthy ingredients remained, and concreted into a calculous mass.

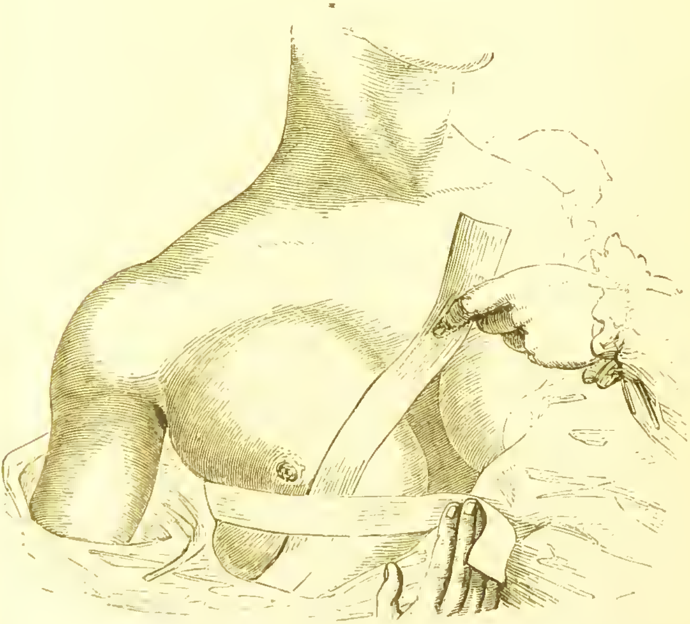
V. ABSCESS IN THE LACTEAL TUBES.—An elderly woman applied to the author some time since with a painful, elongated swelling, stretching from the nipple to the circumference of the breast. It evidently consisted of a lacteal tube which had suppurated; and, after being punctured and yielding half an ounce of pus, it soon got well.

VI. SORE NIPPLES.—Excoriations and cracks of the nipples not only cause great pain and inconvenience in suckling, but are a frequent cause of acute inflammation of the breast. The tannin lotion, originally recommended by the author many years ago, F. 131, and a touch with lunar caustic, to a very deep irritable fissure, were the best remedies, till the discovery of collodion; which is certainly a better means of gluing up and protecting the fissure. The nipple should be defended, if need be, from the clothes and from the child's mouth, by a metallic shield. Women who are subject to this affection should frequently wash the parts with salt and water, or solution of alum, during pregnancy; or should apply every night a liniment composed of equal parts of rectified spirit and olive oil.

VII. ACUTE INFLAMMATION of the breast (*Acute Mastitis*) is known by great swelling, tenderness and pain, and fever. These symptoms are generally soon succeeded by formation of matter. The abscess, if confined by the fascial envelope of the organ, is very slow to point. This affection may occur at any period during lactation. It may be caused by cold—by too stimulating a diet—by neglect in suckling—by irritation propagated from the nipples, and by a loaded state of the bowels and defective biliary and urinary secretion. The suddenness with which it may come on is sometimes surprising. A woman may get up apparently well; may be seized with shivering, pain, swelling of the breast, violent fever, and delirium; and these symptoms as suddenly subside when calomel and black draughts have cleared away some most offensive motions.

Treatment.—At first purgatives, leeches, and fomentations, or poultices after them; the milk should be drawn off, if it can be done without very much pain, and Dover's powder should be given to allay restlessness. The arm should be kept quiet in a sling. So soon as fluctuation is well established, a puncture should be made. And then efficient support should be given by bandages, or by cross strips of adhesive plaster, so as to take off the weight of the organ, compress the distended vessels, and prevent all bagging of matter. Likewise if, after leeches and purgatives, the tenderness and pain diminish, so that there seems a chance of resolution without suppuration, similar support is most useful. The following cut shows the manner in which the breast may be supported by strips of plaster (but those represented are too short): a sufficient number should be applied to cover the entire breast, except the nipple, and they should be long enough to go over the shoulder, so as to suspend the breast, and not allow it to drop.

VIII. CHRONIC INFLAMMATION may be a sequel of the acute; or may be of a scrofulous nature. Swelling and considerable hardness of part, or of the whole of the breast, ending usually in burrowing suppuration, are the characters; tonics, pressure, and puncture of abscesses, the remedies.



IX. NEURALGIA OF THE BREAST may exist *pure et simple*; or may (as more frequently happens) be superadded to a small glandular tumour. Extreme pain, aggravated at each monthly period, and out of proportion to all local structural disease (if any) is the characteristic. The treatment was detailed in the section on Neuralgia.

X. THE TRUE HYDATID DISEASE consists in the development of a parent cyst, containing other secondary cysts, consisting of parasitic animalcules (*echinococcus hominis*) floating in a clear limpid water. It presents a globular oval hard tumour, attended with more or less pain, but no derangement of the general health. As it increases, fluctuation becomes perceptible, and the skin becomes distended and ulcerates.

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* Mode of supporting the breast by strapping.

The cyst may be punctured (p. 162), and allowed to suppurate, or may be excised, which is preferable.

XI. Partial Hypertrophy (*Chronic Mammary Tumour*, of Cooper; *Sero-cystic Disease*, of Brodie; *Imperfect Hypertrophy*, of Birkett; *Glandular Tumour*, of Paget).—Morbid growths of many kinds may be developed upon or near the breast, or within it; including enchondromatous, fatty, and vascular tumours. But the morbid growth which requires to be most carefully studied, and compared with cancer, is *Partial Hypertrophy*, or *Glandular Tumour*.

In this three things will probably be met with. 1. A development of more or less perfect *gland tissue*, the characters of which are delineated at pp. 103, 122. 2. Concurrently with this, a hypertrophy of the *fibrous tissue* (p. 98), which envelopes and intersects the gland; through exudation of fibro-plastic matter, more or less developed into tissue, firm or gelatinous. 3. In the meshes of this interstitial fibrous tissue, *cysts*, or cavities filled with a serous fluid, are exceedingly liable to form (p. 103). The growth of glandular or fibro-plastic matter, projecting into the cavities of the cysts, was formerly designated by the name *sero-cystic sarcoma*. The abundant formation of epithelium has induced some persons, most improperly, to describe this disease as *epithelial cancer*.

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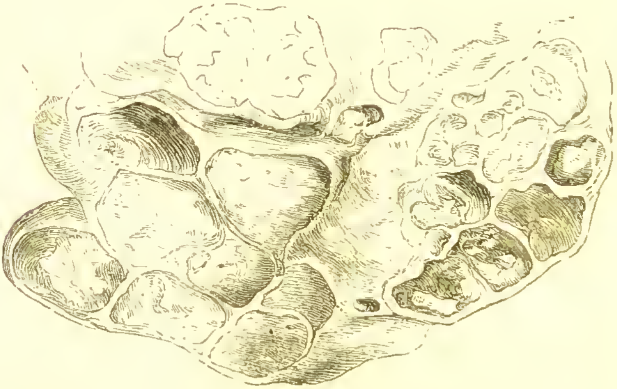

We may add that portions are often found softened, and in a state of fatty decay. The growth is usually slow. The size attained may be enormous. Mr. Fergusson, in 1853, removed one weighing twenty-seven pounds. No *age* is exempt; yet the majority of cases occur in women under thirty-five. The tumour generally commences at the circumference of the breast, and is produced by the hypertrophy of one lobule. It is moveable under the skin; feels granulated just as the natural organ does when its tissue is developed by lactation or during menstruation; may increase so as to cover over and hide, or cause atrophy of the remainder of the organ; yet is not attended with retraction of the nipple, or adhesions, or enlargement of the lymphatic glands. There may be *pain*, especially at the menstrual period, at which time the entire gland becomes more enlarged and tender; yet not the wearing rheumatic pain of cancer. When cysts are formed, fluctuation becomes perceptible at one or more points; the disease increases slowly or quickly; at last it distends the skin, and a round aperture is formed, from which a cauliflower excrescence sprouts out; and the pain and discharge may be very ruinous to the health.

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* From a preparation of the late Dr. Hooper's, now in the King's College Museum. It shows cysts in the breast, some empty, others partially filled, others entirely filled with new growth of glandular tissue.

The disease may last almost any number of years, and may increase to a great size without greatly affecting the health. In some cases it disappears of itself; in others it remains stationary. The writer had (at the date of the 6th edition, 1853) three ladies under his care with this tumour. In one, the mother of eleven children, it came after the health had been broken down by puerperal fever, which completely hindered suckling. This patient (1855) had got well spontaneously. In the second, a very feeble and anæmic person, it came shortly after weaning one child, and disappeared during the next pregnancy. In the third, it was first noticed at nineteen; she was married at twenty-one; at twenty-three the tumour was slowly on the increase, and was excised by Mr. Henry Lee; it furnished a capital specimen of the disease. In a year after the operation, the tumour returned; continued stationary for two years; and in the present year, 1859, has disappeared, concurrently with great improvement in the health.

Treatment.—In the early stages, tonics, and measures adapted to regulate the bowels and the menstrual functions—such as the iodide of potassium with bark, the iodide of iron, saline and chalybeate mineral waters, &c.—should be administered at discretion. If it should be hot, swelled, and painful, a few leeches may be of use. Lebert speaks highly of the tepid douche, and of ointment of iodide of lead in the intervals. The breast should be enveloped in cotton wool. *Severe* pain or distension may be allayed by opiate or belladonna liniment. Lastly, should the growth increase rapidly, with cyst formation or suppuration, the part of the breast containing it should be extirpated.

XII. Gland Cysts (p. 104), not like the last, developed between the lobules, but consisting of an expansion of obstructed gland ducts, may be situated on the surface, in the centre of, or behind the organ; and may be of various sizes, though rarely larger than a filbert. They are lined with epithelium, and enclose a yellow, reddish, or green mucous fluid, containing milky and fatty globules and epithelium, which last accumulates after a time, and renders the contents of the cyst more solid. Serous fluid sometimes exudes from the nipple.*

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* See Birkett on Diseases of the Breast, Lond., 1850.

For these cysts, unaccompanied by glandular tumour, puncture so as to empty them, and moderate pressure may be tried, when perhaps they may shrink with or without suppuration. But if great irritation and discharge are created, a part or the whole of the organ should be removed.

XII. CANCER of the breast is, according to Lebert, of the hard or scirrhous variety, in three-fifths of the number of cases; of the soft or medullary in one-fifth; and of intermediate forms, including a few rare and exceptional cases of melanotic and colloid cancer, in the other fifth. Paget believes that of every hundred primary hard cancers, ninety-five would be found in the breast; and rates the number of soft cancers in this part much lower than Lebert does.

Symptoms.—It is usually felt first as a tumour about the size of a nut; not tender nor painful; situated in, and incorporated with, some part of the breast. It gradually increases, feels excessively hard, becomes irregular or tuberculated, and not circumscribed from the surrounding parts. Its tendency is to increase in breadth, rather than in prominence, and to involve more and more of the gland. In fact the gland may appear shrunken; especially when the disease produces adhesion of the skin and nipple and atrophy of the subcutaneous fatty tissue. From this cause the nipple and the skin often become drawn in and puckered. During this first period, the general health may be good, and the patient only be troubled with slight pains, especially about the menstrual times.

The *second stage* is one of active local progress. Stabbing or lancinating pains of great severity come on; the cancer more and more involves the skin, which reddens, then excoriates, then melts away, forming a chasm with hard jagged edges, greenish ashy surface, most foully-smelling discharge, and pain like coals of fire. This ulcer may be almost stationary for years; or may increase rapidly by sloughing; or may throw up fungous granulations; or even at some part may undergo an imperfect cicatrization. But slowly or quickly, on the disease goes. Adhesion of the gland to the pectoral muscle; cancerous infiltration of the axillary glands, and increasing decay of health and strength, complete the usual phenomena of this stage.

In the *third stage*, other organs become affected. Severe rheumatic pains, deposit of cancer in the bones, with perhaps fracture; cancerous deposits in the liver, with consequent sickness, and failure of appetite; or in the uterus, or the breast; infiltration of the ribs and intercostal muscles, and effusion into the pleura, with pleuritic pain and dyspnœa: these added to the constantly-increasing original disease, at last wear out the miserable remnant of the patient's life.

The average age at which this disease begins, is from thirty-five to fifty-five. Of 62 cases adduced by Lebert, 158 by Paget, 147 by Birkett, 22 only appeared before thirty. There is no evidence whatever of any essential connexion of this disease with marriage, celibacy, sterility, previous disease, mental causes, or external violence. The average duration of life is less than four years; but in this matter there is great diversity. In some cases the disease begins with a furious onslaught, and kills in a few months. The younger and more robust the patient, and rapid the early symptoms, the worse will the prognosis be. On the contrary, cancer affecting the aged and atrophied, may linger on for many years, and kill the patient by inches.

Treatment.—The first question that will arise, is the propriety of extirpation; regarding which we must refer to p. 117. Suffice it to say, that although it were proved that the operation does not prolong life in the end; although the disease is sure to return in the cicatrix, in the other breast, or elsewhere; yet, that the surgeon should advise it as a means of procuring about a twelvemonth's relief from the weariness and anxiety of disease; provided, 1, that the internal organs are sound, and the health such that the operation itself is not likely to be mortal; and 2, that the breast is yet not so adherent, nor the glands so diseased as to render it unlikely that the wound will cicatrize. Again, an exceedingly rapid progress, especially of soft cancer, in young persons, may render the operation hopeless; whilst an exceedingly slow progress in the old would render it unnecessary.

Palliatives.—But, in proportion to the hopelessness of cure, so ought our efforts to be strenuous in devising means for assuaging the bodily torments, the loathsomeness, the mental despondency, which render the sufferer insupportable to herself and to others. In addition to the directions which we have already given (p. 119), we may subjoin the following brief hints to the younger practitioner.

In the first place, study the effects of opium and other narcotics on each individual patient. Learn the form and combination which serve in smallest doses to procure sleep by night, and to allay pain by day, with least headache and loss of appetite. When the ordinary forms of opium or morphia do not agree, try the black drop; the preparations of Squire, Battly, or Jeremie; make great use of opiates locally. Try chloroform inhalation in its mildest degree. We have observed great relief to the miserable rheumatic pains from daily administration of sulphuric or chloric æther; or of negus or good beer. Lebert speaks highly of the value of sulphate of quinine for the same purpose. Thus death will be postponed so far as it is induced by the exhaustion of pain. In the next place, for a disorder, whose starting-point is some error of nutrition, it is more than probable, that, if any remedy is to be found, it will be in some article of diet, which shall supply to the cancer matter, the complemental material required for its conversion into healthy plastic matter. Besides the articles mentioned at p. 119, turtle soup, eels, American oysters, Edinburgh ale, Tent or Constantia, oatmeal porridge, with wine or beer, may give a stimulus to nutrition. As to particular symptoms, the *œdema of the arm*, which is often such a distressing complication of the later stages of this disease, may be somewhat retarded by bandages, and by keeping the limb in an elevated posture. Blisters near the shoulder, and punctures of the skin, may be tried when it becomes excessive. Itchings may be allayed by glycerine, infusion of tobacco, tincture of aconite or of belladonna painted on the part; or by baths of bran or gelatine; or by the local application of chloroform, and especially by astringents, as the tincture of galls, or solution of tannin. It is important to save the skin from excoriation as long as possible, by tannin, black wash, bismuth, &c.

XIV. Extirpation of the Breast is thus performed:—The patient being narcotized and on a convenient couch, an assistant takes the arm of the affected side and holds it out, so as to put the pectoralis on the stretch. The surgeon then makes a semi-elliptical incision below the nipple along the lower border of the pectoralis major, and another on the upper and inner side of the nipple, so as to include that part between them. He next dissects out the lower and outer part of the gland, quite down to the pectoralis (taking care not to get behind that muscle), and then, cutting from below upwards, he separates the remainder. If an adjacent gland is enlarged, the incisions should be managed so as to include it also. When the mass is removed, its surface should be wiped and examined, and the wound should also be well examined, to ascertain that no part of the gland, and that no hardened or discoloured portions of cellular tissue or of muscular fibre, are left behind. Arteries are then to be tied, and the patient to be put to bed, and when all oozing has ceased, sutures and a few strips of adhesive plaster may be applied. If desirable to effect gentle pressure on the wound, to stop oozing, a small flat sand-bag, says Mr. Birkett, may be placed upon the flaps.

XV. Men occasionally suffer from cancer of the breast, and other morbid growths, which manifest themselves in the same manner, and require the same treatment as in the female.*

CHAPTER XXIV.

DISEASES OF THE HANDS AND FEET—CLUB-FOOT, AND OTHER DEFORMITIES OF THE LIMBS.

I. Club-Foot (Talipes) signifies a deformity of the foot, produced by rigidity and contraction of various muscles of the leg. 1. In the most simple and most common variety, *talipes equinus*, the heel merely is raised, so that the patient walks on the ball of the foot. 2. In the *talipes varus*, which is the more common *congenital* form of club-foot, the distortion is much more complex. In the first place the heel is raised; secondly, the inner edge of the foot is drawn upwards; and thirdly, the anterior two-thirds of the foot are twisted inwards; so that the patient walks on the outer edge, and in confirmed cases, on the dorsum of the foot, and outer ankle. 3. In the *talipes valgus* the outer edge of the foot is raised up, and the patient walks on the inner ankle. (See fig. 3.) 4. In the *talipes calcaneus* the toes are raised and the heel is depressed, so that the patient walks upon it.

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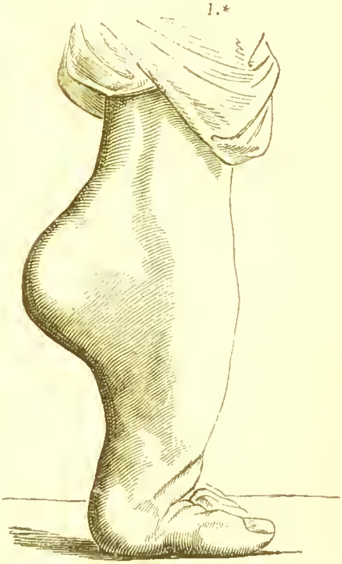
* For all necessary information, see Mr. Birkett's Treatise on Diseases of the Breast; Lebert, op. cit.; Paget, Lectures, vol. ii.

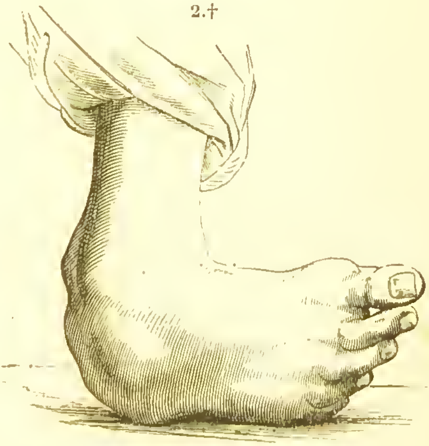
1.*



There are also compound varieties; as the talipes *equino-varus*, *equino-valgus*, and *calcaneo-valgus*; whose names sufficiently point out their nature.

Each of these deformities may be *congenital*, or may come on after birth, with the exception of the talipes equinus, respecting which, it is very doubtful if it is ever congenital.

2.†



Causes.—Their origin may be traced to contraction and shortening of muscles. The *exciting causes* may be any circumstances that interfere with the supply of nervous influence, or with the proper nutrition of the muscles. Thus, to take the simplest case first, it may be caused by primary spasm affecting one or many muscles; and this again may be dependent (in non-congenital cases), 1st, on a rheumatic or sub-inflammatory state of those muscles; 2ndly, on irritation propagated directly from the spinal cord, from actual disorder of that part;

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* Talipes equinus, from a cast in the King's College Museum.
† Talipes varus, from the King's College Museum.

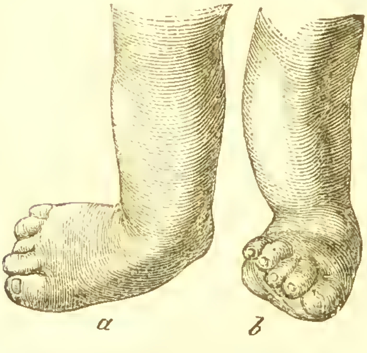
3rdly, on irritation reflected from the spinal cord, but originating in disorder of some other organ, especially of the bowels. The cause of intra-uterine spasm is probably some shock to the nervous system of the mother.

Secondly, instead of being caused by primary spasm of any given muscles, it (in non-congenital cases) may be caused by primary paralysis of their antagonists; so that there being no proper balance of forces about the ankle joint, the foot becomes fixed in one of the above-mentioned deformed positions; probably by a process of *adapted atrophy:* which is, in plain English, a process by which a muscle shortens itself permanently, if long placed in a shortened position.

Thirdly. It may be caused as a sequel of bruises, injuries, or disease of joints. (See Spurious Anchylosis, p. 273.)

General Treatment.—The indications are, *first* (in non-congenital cases), to remove all causes, and to soothe spasm, and give power to palsied muscles. If any case comes under treatment, before the contracted muscles have become fixed in their rigidity, this may be done by purgatives, and other means of sweeping away excentric causes of irritation; or by fomentations and anti-rheumatic remedies, as the case may be. The writer has met, in his practice as an accoucheur, with cases of valgus in newly-born children from spasm of the peronæi and other muscles which raise the outer edge of the foot; in which castor oil and friction, and manipulation, effected a cure; in other cases, if the spasm has seemed obstinate, he has divided whatever tendons were rigid. In one case this form of spasmodic valgus was associated with wry neck. Both did well. Tonics, especially steel, are of service with older children.

3.*



The cases in which deformity arises from paralysis are less promising. But here a distinction must be drawn between local paralysis and general. Local paralysis, such as the blighting and atrophy of an entire limb, from exposure to cold, or even from fever, or irritation of teething, is curable by friction, galvanism, and other means of keeping the muscles from lapsing into quietude and degeneration, combined with tonics and proper nourishment. But when it depends on primary disease of the nervous centres, such as a hydrocephalic attack in a strumous child, and in adult paralysis generally, it is much less so.

As to mechanical measures, in slight cases, splints of gutta percha, or of wood, with bandages, and great care, may do everything. But delay is injurious; and from the healthy condition of the muscles at birth, active treatment will be more likely to be satisfactory if adopted early.

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* Talipes valgus, from Mr. W. Adams's collection.

Therefore if these measures do no speedy good, it is better soon to resort to Stromeyer's operation of *subcutaneous tenotomy;* our knowledge of which, and in fact of the entire pathology of these deformities, and the establishment of what is now called *orthopædic surgery*, is dated from the publication of Dr. Little's Thesis, in 1837.*

The rationale of this operation may readily be comprehended. The tendon being divided, its separated extremities heal by a new connective tissue, which renders it longer, and which, while recent, may be stretched to any desired length. Thus the mechanical shortening of the muscle is neutralized. At the same time, the antagonist muscles, which become wasted and inert, are relieved from a constant state of tension, and are enabled to resume their natural functions, so that the limb rapidly increases in strength and bulk. The operation is easily performed thus:—The tendon is put on the stretch; and a narrow sharp-pointed knife is thrust through the skin on one side of it; then its edge is turned against the tendon, and made to divide it as it is being withdrawn. The tendon to be divided is the tendo Achillis in the talipes *equinus*. The same in the *varus*, and those of the tibialis posticus, anticus, and flexor longus digitorum. In the *valgus*, the peronæi and the extensor longus digitorum: any tendons, in fact, which oppose the restoration of the foot to its proper position. It is often expedient to divide a portion of the plantar fascia, or of the muscles of the sole of the foot. Immediately after the operation, the foot should be put quietly up with splint and roller, with a dossil of lint and strip of plaster over the punctures, and be retained in the same position of deformity as before the operation. In the course of four or five days, apparatus must be adapted for bringing the part into proper shape.

II. TALIPES VARUS.—In the foregoing paragraphs we have described club-foot generally. Now we proceed to detail the anatomy more particularly of the talipes varus, and in so doing avail ourselves of the description, by Mr. W. Adams,† of a severe form in an adult female: since essentially similar deviations, especially in the head of the astragalus, exist in the fœtus at birth.‡

In reference to this deformity, the foot may be regarded as consisting of two portions, which move in different directions upon two distinct centres of motion. The division between these two portions corresponds to the articulation between the first and second rows of the tarsal bones, viz.:—between the astragalus and scaphoid, and the os calcis and cuboid bones (indicated by the oblique dotted line in fig. 6). At this great transverse tarsal joint, a considerable amount of motion exists in the healthy condition of the foot; and in talipes varus the inversion of the foot takes place essentially from this centre of motion, and involves only the anterior two-thirds of the foot. The posterior third of the foot, consisting of the os calcis and astragalus, has its centre of motion in the ankle-joint, from the construction of which it can only move in the direction of flexion and extension; at least this is essentially the direction of its motion.

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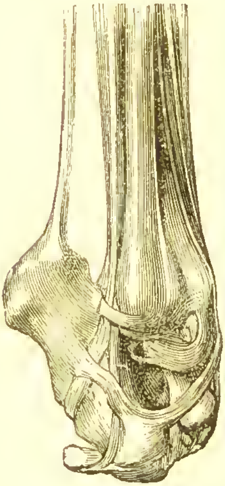
* Symbolæ ad Talipedem Cognoscendum, Berol., 1837. See also Dr. Little's Treatise on Deformities, Lond., 1853.

† The writer has to thank Mr. Adams for the three cuts illustrative of the anatomy, which are taken from his original paper in Trans. of Patholog. Soc., vol. vi., 1855.

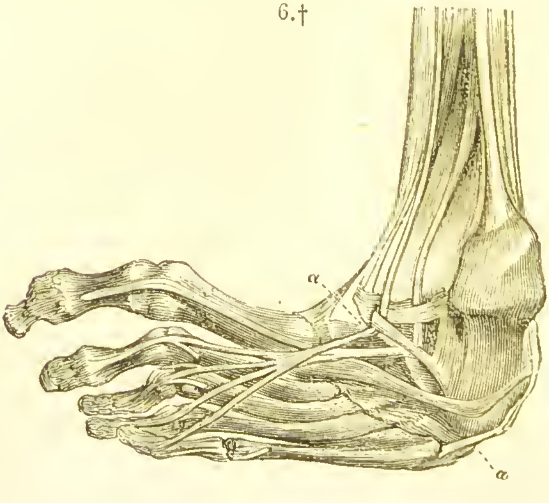
‡ See vol. iii. of the Trans. of the Pathol. Soc., where representations of the fœtal astragalus are given.

5.*



In a severe case as that represented, the posterior third of the foot is elevated by the action of the muscles of the calf upon the os calcis, and the astragalus is raised from its horizontal into a vertical position; its centre of motion being at the ankle-joint. The anterior two-thirds of the foot are drawn inwards and upwards, producing the inversion characteristic of varus, by contraction of the tibialis anticus and pos-

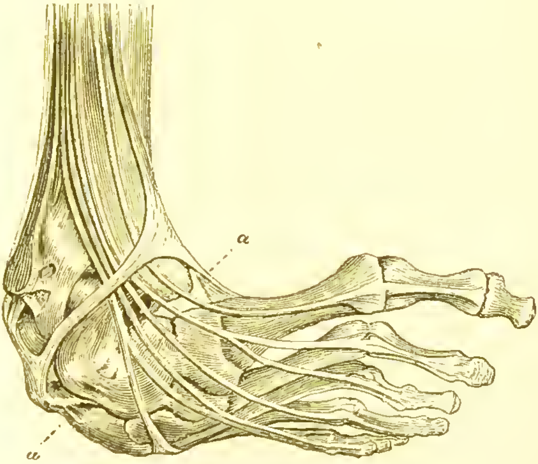
6.†



* Talipes varus; outer side of leg.
† Posterior aspect of leg, and sole of foot.

ticus, the flexor longus digitorum, and in severe cases the extensor and flexor pollicis; its centre of motion at the great tarsal joint is indicated by the dotted line in figs. 6 and 7. In this movement the navicular bone is drawn directly under the inner malleolus (see fig. 7). These are the only movements essential to varus; but, in some cases, shortening of the foot takes place from contraction of the plantar fascia and flexor brevis—and also in severe cases, after the period of walking, more or less transverse rotation of the foot takes place from the superincumbent weight telling upon the foot in the act of progression, so as to narrow the transverse arch, and approximate the fifth to the first metatarsal bones, as seen in fig. 6.

7.*



As a result of these changes in position affecting different portions of the foot, the bones become somewhat misshapen. The head of the astragalus presents the most important deviation in form, which Mr. Adams, in opposition to Scarpa and Little, describes as existing at birth, and regards as an adaptation of the bone in its cartilaginous condition to the altered position of the navicular bone. In a severe case, the head of the astragalus, instead of its regularly convex surface directed anteriorly, as in the healthy foot, presents two articular facets at right angles to each other, and divided by an abrupt line; one, the larger, looking directly inwards, and articulating with the displaced navicular bone; the other, looking directly forwards, is left exposed by the altered portion of the navicular bone, and covered only by the elongated portion of the ligament which in a healthy state connects these bones.

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* Anterior aspect of leg, and dorsum of foot.

The most important alterations in the direction of the *tendons* relate to those of the anterior and posterior tibial muscles. The anterior tibial tendon deviates to the inner side, and crosses the inner malleolus in a curved direction downwards and backwards in proportion to the severity of the case. The posterior tibial tendon does not pass from *behind* the inner ankle obliquely downwards and forwards, beneath and then in front of this process towards the navicular bone, as in a state of health; because the navicular bone itself is displaced inwards, backwards and upwards, by the contraction of the tibialis posticus muscle, so as to be held in contact, and articulate with the inner malleolus. The tendon, therefore, passes directly *downwards* to its insertion, or even with a slight inclination *backwards*.[*] In fig. 6, this tendon turns a little under the malleolus to reach the navicular.

The *ligaments* are elongated in front of the ankle-joint, and on the convexity of the foot, and shortened in the sole of the foot and behind the ankle-joint, in proportion to the severity of the case, and its duration.

Treatment.—In the cure of talipes varus, the great practical rule is to divide the treatment into two distinct stages, and to accomplish the objects of the first stage very thoroughly before commencing the second.

In the *first* stage the *inversion* of the foot is to be overcome by division of the anterior and posterior tibial tendons, and that of the flexor longus digitorum; and then by bandaging the foot to a straight splint placed on the outside of the leg extending to the knee. For an infant

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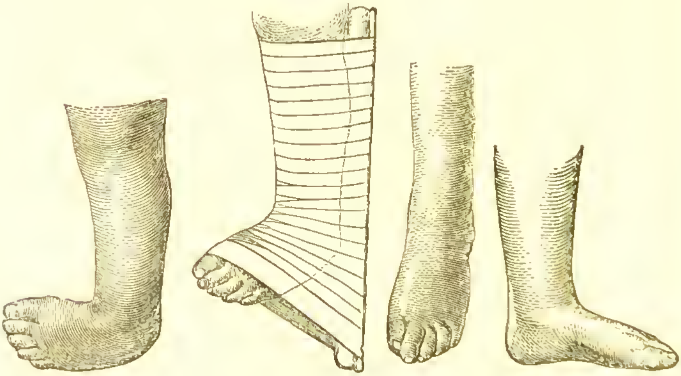

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[*] As in case exhibited to the Pathological Society by Mr. H. Thompson, vol. vi., p. 357.

[†] The above four cuts, for which the author has to thank Mr. W. Adams, exhibit—1, talipes varus; 2, the bandage applied after division of the tibialis tendons; 3, the distortion reduced to simple equinus; 4, restoration complete.

the splint should be 1½ inch in width and made of wood, or sheet iron, softly padded. When by this means the foot is sufficiently everted so as to form a straight line with the leg, and does not exhibit any disposition to turn inwards upon the removal of the bandage; when in fact, instead of varus, a state of extreme *equinus* has been produced,—the *second* stage may be commenced. This consists in dividing the tendo Achillis, and subsequently bringing down the heel by means of a Scarpa's shoe; or in slight infantile cases the foot may be bandaged to a bent splint applied in front of the ankle-joint. In slight cases it is by some recommended to divide all the tendons at once, but the objects are best accomplished by dividing the treatment into two stages.

In severe adult cases, and where the deformity is extreme, and accompanied with much rigidity, the same principle is to be followed, but a more complicated apparatus is desirable. That invented by Mr. Adams, and described in his lectures on "Orthopædic Surgery," appears to be well adapted for these cases.*

III.—WEAK ANKLES and FLAT FOOT.—In this affection the foot is flattened, its arch is sunk, and the astragalus forms a projection below the internal malleolus, rendering the internal border of the foot convex, instead of concave. In bad cases the inner ankle almost touches the ground, and the patient walks with great pain and lameness. This affection depends on a weakness and relaxation of the ligaments, and is more common amongst girls than boys.

Treatment.—The patient should wear shoes or boots with high heels, and with the inner edge of the heel much thicker than the outer, He should also be directed to turn the foot out very little, if at all. Benefit may also be derived from a well-applied bandage, such as is represented at p. 68. It should always be applied so as to be carried round the ankle from the inner side of the foot. In severe cases the patient should wear a boot with a piece of steel or whalebone fastened to the sole, and passing perpendicularly upwards to the middle of the inner side of the leg, and having an india-rubber pad to support the arch of the foot.

IV. KNOCK KNEES are treated by Mr. Lonsdale on the same principles as the crooked rickety leg; by adapting a long well-padded splint to the outer side of each limb, fastening it below by straps and buckles at the outer ankles, and above by a broad belt, to which both splints are attached, and which is buckled round the body at the level of the hollow part of the loins. The splints should be hindered from coming too far forwards, and should bear well against the trochanter and outer ankle. Meanwhile, the knee is to be drawn into its proper place by a band buckled over it, and wide enough to embrace both the head of the tibia and condyles of the femur.†

V. CONTRACTION OF THE TOES.—It often happens that one of the toes is permanently elevated, and rides over its neighbours, from the habitual use of narrow boots; and the upper surface of this toe, being peculiarly exposed to friction, is generally covered with corns so painful, that many persons have been compelled to have the part amputated. Or the toe may be bent into the position of the so-called *hammer-toe.* Division of the extensor tendon (or of the flexor, in the hammer-toe variety,) may, however, enable the toe to be brought down into its place, and prevent the necessity of amputation.

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* Med. Times and Gazette, 1856.

† Lonsdale, Med. Gaz., June 1849.

VI. Bunion—a swelling over the metatarsal joint of the great toe—is a disorder which is much more talked of than understood, but which the writer has taken pains to study the varieties of, which are these: 1. A recent bursal tumour, or ganglion; thin, easily burst under the skin by pressure, which is the proper treatment. 2. A thickened bursa in the same place, filled more or less with liquid, somewhat tender and inflamed. Rest, a leech or two, fomentation, and anti-arthritic purges. 3. The same bursa in an indolent state; thickened but not tender. Iodine paint, or empl. hydrag. 4. The same in a state of suppuration. To be treated like any other abscess or fistula, according to its condition.

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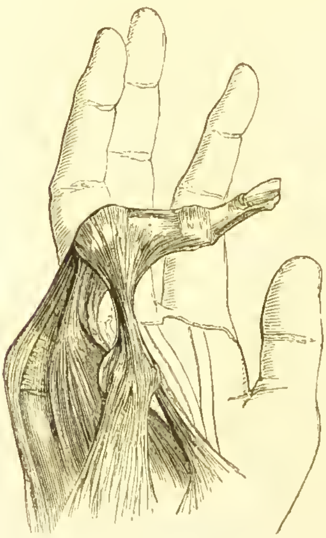

5. Different from all these is a distortion of the foot, in which the great toe is thrown outwards, whilst the head of the metatarsal bone projects and forms a swelling on the inner side of the foot; but the foregoing bursal swellings may be superadded. This affection depends on natural formation, and the changes induced by age and labour, and above all, by gouty enlargement. Beyond properly-fitting boots, roomy at the toes, tightly fitting the instep, there is little to be done for this; unless any tendon which pulls the toe outwards can be divided, and the joint be restored by extension with a splint; all the preceding four varieties, however, are curable.

VII. Contraction of the Fingers generally depends, not on any spasm of the tendons, but, as Mr. Partridge has shown the writer, on shortening and rigidity of the palmar aponeurosis and tendinous sheaths; or on a ligamentous degeneration of the areolar tissue on the palmar aspect of the fingers. This is a part of the morbid changes accompanying *chronic rheumatic arthritis.*

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* Contraction of the palmar aponeurosis. From a dissection by Mr. Partridge.

Treatment.—Friction and extension are of no use. But the contracted tissues may be divided by subcutaneous section. If any of the muscles of the fore-arm be rigid, its tendon may be divided.

VIII. CONGENITAL CONTRACTION OF FINGERS is generally seen in the little finger, and is not very uncommon. The finger can be straightened, but the skin is then seen to be very tightly stretched in a line at the junction of its radial with its palmar surfaces, and, as it were, continuous with the cutaneous web between the fingers. The last phalanx of the finger is always drawn inwards, as well as bent; and the contraction depends upon a congenital deficiency of the skin in the direction of the length of the finger. Thus a longitudinal web is produced by extension. The most diagnostic sign is the absence of the deep transverse folds in the skin corresponding to the bend of the joints. In contractions produced by muscular action these transverse cutaneous folds are deepened instead of being obliterated.

Treatment.—This form of contraction does not require any division of tendons, but yields to long-continued mechanical extension, constantly applied for several months, or perhaps a year. A steel plate may be adapted to the palmar and dorsal aspects of the outer third of the hand, and held in position by elastic bands, so as to afford a fixed point, and from this plate a straight and narrow bar of steel may be carried along the upper and outer margin of the finger; a little ingenuity in padding and bandaging will then bring the finger into a straight position.*

IX. WEBBED FINGERS.—This is a deformity consisting of an union of the fingers to each other. It may be congenital, or may be caused by burns. It is a most intractable affection. Mere division of the connecting skin is not often of any avail, for the fingers almost inevitably grow together again when the wound heals. In order to counteract their union, a flap of skin may either be brought from the dorsum of the hand and be engrafted between the fingers, or, as Mr. Liston proposed, a perforation may first of all be made in the connecting skin near the roots of the fingers, and be prevented from closing by keeping a piece of cord in it till the edges have healed, and then the remainder of the connexion may be divided.

X. ULCERS ABOUT THE NAILS.—1. A very common and troublesome affection is that which is popularly termed "*the growth of the nail into the flesh,*" and which most usually occurs by the side of the great toe. It does not, however, arise from any alteration in the nail, as its name would imply, but the contiguous soft parts are first swelled and inflamed by constant pressure against the edge from the use of tight shoes. If this state be permitted to increase, suppuration occurs, and an ulcer is formed with fungous and exquisitely-sensible granulations, in which the edge of the nail is embedded, and which often produces so much pain as totally to prevent walking.

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* This instrument is constructed under Mr. W. Adams's direction by Bigg, of Leicester Square.

Treatment.—The objects are to remove the irritation caused by the nail, and reduce the swelling of the soft parts. In most cases, if the nail, having been well softened by soaking in warm water, is shaved as thin as possible with a bit of glass, the pain and irritation may easily be allayed by rest for a day or two, with fomentations and poultices; and then any ulcer that has formed will soon heal, with the aid of black wash on lint, or a touch of lunar caustic. But if the case is more obstinate, the edge of the nail may be removed, by passing the sharp blade of a pair of scissors resolutely under the nail, cutting it through, and then quickly tearing away the offending portion with forceps. The pain attending this operation renders chloroform expedient.

XI. Onychia Maligna is a peculiarly unhealthy ulcer occurring at the root of the nail, either of the fingers or toes, but more frequently of the latter. It commences with a deep-red swelling, and an oozing of a thin ichor from under the fold of skin at the root of the nail; and, lastly, an ulcer is formed, with a smooth tawny or brown surface, a very fetid sanious discharge, and swelled jagged edges of a peculiar livid dusky hue. It is in general extremely painful, especially at night.

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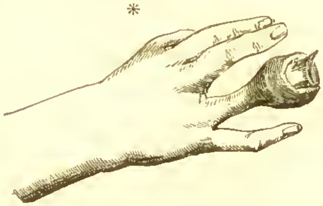

Treatment.—Mr. Wardrop recommends mercury to be employed, so as to affect the gums in about a fortnight; and says that then the swelling will generally subside, and the ulcer become clean. The mercurial effect should be continued gently till the sore is healed, and for a short time afterwards. The best local applications are solution of arsenic (liq. arsen. ʒij. ad aq. ℥ij.) as recommended by Mr. Abernethy, which will generally be found to succeed; or solution of nitrate of silver, or black or yellow wash.†

XII. Whitlow, or Paronychia, signifies an abscess of the fingers. There are four kinds: the *cutaneous*, *subcutaneous*, *tendinous*, and *carbuncular*. The cutaneous whitlow consists of inflammation of the surface of the skin of the last phalanx, with burning pain, and effusion of a serous or bloody fluid which elevates the cuticle into a bladder. The subcutaneous is attended with greater pain and throbbing, and suppuration *under* the skin at the root of the nail, which may come off.

Treatment.—Purgatives, followed by tonics; fomentations, and poultices; but if these measures do not easily cause resolution, a pretty free incision should be made into the inflamed part. If the tip of the finger is long painful and tender without suppurating, it should be well pencilled with lunar caustic. The resin ointment is recommended by Mr. Vincent as an application, after the part has been opened.

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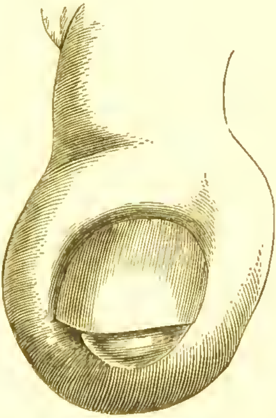
* From a cast in the King's College Museum.

† Vide Lawrence, Lectures, in Med. Gaz.; James Wardrop, F.R.S.E., on Diseases of the Toes and Fingers, Med. Chir. Trans., vol. v.

The *tendinous whitlow*, or *thecal abscess*, affects the tendinous sheath or periosteum, and was described at p. 212. We may observe here, however, that if purgatives and fomentations do not speedily relieve, the finger should be freely laid open with a scalpel. If matter have extended into the palm, the incision should be continued along the metacarpal bone till it freely gushes out. It is better not to cut into the spaces *between* the metacarpal bones (unless matter points there very decidedly indeed), for fear of wounding the digital artery. If it be necessary to slit up the palmar fascia, a cut should be made over the head of a metacarpal bone, in order that a director may be passed under it.

The *carbuncular whitlow* is an unhealthy infiltration of the subcutaneous tissue of the finger, brawny, slow to suppurate, and altogether resembling, and requiring the treatment of, carbuncle, p. 207.

XIII. Exostosis.—A fibrous tumour, which subsequently ossifies,



is not uncommon on the dorsal surface of the last phalanx of the great toe. To cut away the anterior half of the nail, and dissect it out, is the only useful treatment.

PART V.

OF THE OPERATIONS OF SURGERY.

CHAPTER I.

OF OPERATIONS IN GENERAL.

I. The Apparatus necessary for operations in general comprises bistouries, scalpels, or other cutting instruments adapted for specific purposes, dissecting forceps, tenaculum, and Assalini's forceps to take up arteries; plenty of hempen ligatures, needles threaded, fine sponge, water both warm and cold, and brandy and hartshorn in case of faintness. There should also be a sufficient number of assistants—there should be one whose sole business it should be to administer the chloroform, and to watch its effects; others to keep the patient in a proper position, to hand the different instruments to the surgeon, or to assist him in other respects; besides a good light, and a bed or table, with pillows or cushions to make the patient's position as convenient as possible. Mr. Fergusson gives the useful hint that it is desirable to have delicate instruments made to shut in a handle like a pocket clasp-knife, so that they may be kept in the surgeon's waistcoat-pocket till they are wanted, and that their edge or point may not be injured through the carelessness of the assistants.

Moreover, the operator should *himself see* that everything is at hand that may be wanted. It would be awkward in the middle of an amputation to send out for a saw.

II. Incisions.—In making incisions there are several points that demand attention. First of all, the manner of handling the knife, which, as systematic writers say, may be held either like a common dinner knife, or like a pen, or like a fiddlestick. The first two positions are those which are employed commonly; the third is resorted to in cutting into the different layers over a hernial sac, and in sundry other delicate operations. Secondly, before commencing an incision, the skin must be gently stretched and steadied with the points of the fingers, otherwise it will be dragged along by the knife, and the incision will be ragged, and shorter than was intended. Thirdly, in cutting through the skin, the knife should be passed in at right angles to the surface, and should be at once carried down to the subcutaneous tissue; then the blade should be inclined downwards, and be made to cut through the skin to the requisite extent; and, lastly, as the incision is finished, the instrument must be again brought to a right angle with the surface. By these means the whole thickness of the skin will be cleanly divided, both at the beginning and end of the incision. Timid operators are apt to make the incision through the skin too limited, which embarrasses their subsequent proceedings; besides that cutting more of the skin subsequently (unless the patient is under the influence of chloroform) is very painful.

When two incisions are to be made to meet near their extremities (as, for example, the two semi-elliptical incisions in amputation of the breast), the second should fall into the first *nearly*, but *not quite at its extremity*, so that there may be no little isthmus of skin left undivided between them Again, in making a V incision, the second cut should not be begun where the first terminated, but at its other end; that is to say, it should be made *towards* the first, and not *from* it. In making a T incision likewise, the transverse cut should be made first, and the other be directed towards it. Lastly, the angle of a V incision should, if possible, be always dependent.

III. PREPARATION.—The object is to have every organ and every function in as healthy and tranquil a state as possible. Recourse should be had to regular diet, aperients, and gentle alteratives, with or without small doses of sedatives, till the pulse has become quiet, the tongue clean, the bowels regular, the liver, kidneys, and skin in good order, and the mind cheerful.

IV. THE AFTER-TREATMENT should be conducted so as to ward off the most probable sources of danger—whether sinking from shock, or from loss of blood, or the occurrence of unhealthy changes in the surface of the wound and in the fluids exuded thereby, such as give rise to the various kinds of inflammation, phlebitis, erysipelas, diffused inflammations, and pyæmia. In the observations we have made on incised wounds, we have shown how important it is that the patient should be supplied with beef-tea, and solid nourishment, and with wine in sufficient quantity to maintain a healthy state of blood; and that he should be kept quiet. The late Mr. Copeland is said always to have given his patients half a grain of opium every five or six hours for the first two or three days after an operation, for the purpose of tranquillizing the nervous system, and his success proved the benefit of the plan.

V. AIR IN VEINS.—The entrance of large quantities of air into a vein is a most dangerous accident, that has sometimes occurred during the extirpation of tumours from the neck or axilla. A large vein being cut across, whose coats adhere to some firm textures around, so that they cannot collapse, a sort of bubbling sucking noise is suddenly heard, the patient instantly faints, and generally dies soon afterwards. On examination the right auricle is found distended with frothy blood. If any such sound should be perceived during an operation, the surgeon should instantly put his fingers on the spot that it proceeds from, and the patient, if faint, should be kept in the recumbent position with the head low, and should be well plied with brandy. The air has no noxious properties in itself, and if introduced slowly, in small quantity, does no harm; large quantities prove fatal by interfering mechanically with the action of the heart.[*]

CHAPTER II.

MEANS OF PRODUCING INSENSIBILITY TO PAIN.

HISTORY.—So terrible is the idea of the surgeon's knife, that it cannot be wondered at that many attempts have been made, at various times since surgery was first cultivated, to diminish the tortures which it inflicts, both in apprehension and in reality. Dr. Simpson[†] brings forward quotations from Dioscorides, Pliny, and Apuleius, authors of the Roman empire, showing that in that age the root of the mandragore or mandrake (*atropa mandragora*) steeped in wine, was given to cause insensibility (ποιεῖν ἀναισθησίαν) in persons who were to be cut or cauterized; and that whilst the influence of this remedy lasted, a limb might be cut off without any pain or sensation. The seeds of the rocket (*eruca*) infused in wine were taken, according to Pliny, by criminals about to undergo the lash, in order to induce a certain recklessness or hardihood of feeling. The vinegar mingled with gall, mentioned by St. Matthew (or the wine mingled with myrrh, as it is rendered by St. Mark) ,which was offered to our Saviour before his Passion, furnishes an instance familiar to every one. The *bang*, or extract of Indian hemp, is used in India for the same purpose at the present day. Dr. Simpson has shown further that the inhalation of narcotic vapours was used as a preparatory to surgical operations in the thirteenth century.

So far concerning the ancients. The modern history of anæsthetics may be said to begin at the end of the eighteenth century, when Mr. James Moore, son of Dr. Moore of Clifford Street, and house-surgeon to St. George's Hospital, introduced a plan for diminishing the sensibility of limbs before amputation, by compressing the principal nerves. This he effected by means of an instrument resembling Signoroni's torniquet, depicted in the chapter on Aneurism, except that his instrument consisted of a horseshoe-shaped arch of steel, with a pad at each extremity, and a screw to act upon one of the pads. Moore was permitted by John Hunter, in 1784, to try his plan upon a patient in St. George's Hospital, who had lost all his toes, and had a large irritable ulcer on his foot, and whose leg, after having been submitted to the process, was cut off below the knee by Mr. Hunter, with an extremely small amount of pain.[*] This plan, however, was soon given up; it is not certain, and is not without some disadvantages; for Malgaigne,[†] who attempted by this means to benumb a patient's leg, before an operation, found that although some amount of insensibility was produced, yet that considerable pain was caused by the instruments used for compression.

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[*] For the best account of these curious cases, refer to Sir C. Bell's Practical Essays, Lond., 1841.

[†] Edinburgh Monthly Journal of Medical Science, December 1847; Simpson's Obstetric Works, 1856, vol. ii.

At the end of the last century the brilliant discoveries of oxygen and other gases by Priestley, Black, and Cavendish, and the fervent study of *pneumatic chemistry*, created a new, though very short-lived branch of therapeutics. The attention of the profession was hopefully directed to *pneumatic medecine*, as it was called; that is, to the possibility of curing diseases, and especially consumption, by the inhalation of various kinds of gases. A Medical Pneumatic Institution was set up at Clifton by Dr. Beddoes,[‡] with huge reservoirs of gases for the use of patients. Humphry Davy, just out of his apprenticeship, was appointed superintendent in 1799;—his experiments on the inhalation of nitrous oxide, added to the excitement;—S. T. Coleridge, Robert Southey, John Rickman, P. Roget, Boulton, Watt, Wedgwood, and others, since distinguished as poets and philosophers, eagerly made proof of the effects of the intoxicating gas;—the *gaz oxygenium* and *gaz acidum carbonicum*, and other gases, were introduced into the catalogues of medicinal drugs; it was now fondly hoped that we were in possession of remedies simple, and certain, for almost all maladies; and even Davy, though far from participating in the sanguine dreams of Beddoes, believed it possible that by various combinations of carburetted hydrogen and nitrous oxide, "we should be in possession of a regular series of exciting and depressing powers, applicable to every deviation of the constitution from health." But experience ruthlessly proved the fallacy of these, as of many other ingenious and plausible speculations. In the course of his experiments, however, Davy found that the nitrous oxide relieved him from headache after a profound fit of intoxication which he had brought on by drinking a bottle of wine in eight minutes, with the purpose of comparing the effects of wine with those of the intoxicating gas; he also found that it mitigated the pain of cutting a wisdom tooth; and he threw out the hint that as it appeared "capable of destroying physical pain, so it might probably be used with advantage during surgical operations." [§]

Nothing in good earnest, however, was done; there was no established or systematic use of anæsthetic means until the year 1844, when

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[*] A Method of preventing or diminishing pain in several operations of Surgery, by James Moore, Member of the Surgeons' Company of London. 1784.

[†] Malgaigne's Operative Surgery, by Brittan, p. 42.

[‡] A Letter to Erasmus Darwin, M.D., on a New Method of Treating Pulmonary Consumption. By Thomas Beddoes, M.D. Bristol, 1793.

[§] See Memoir of Sir H. Davy, by his brother, John Davy, M.D., Lond., 1839 and Researches, Chemical and Philosophical, by Humphry Davy, Superintendent of the Medical Pneumatic Institution, Lond., 1800, p. 465, *et seq.*

Horace Wells, a dentist of Hartford, Conn., U.S., acting upon Davy's suggestion, both inhaled the nitrous oxide gas himself before one of his teeth was extracted, with the effect of producing a complete unconsciousness of pain, and administered it to several patients who underwent the same operation, with the same beneficial results. In the December of that year he visited Boston, and made public trial of the administration of the gas, before the Medical College of that city. But this experiment failed from want of proper management; and the failure subjected Wells to so great an amount of ridicule, that he fell sick through vexation, retired from practice as a dentist, engaged himself in stuffing and exhibiting birds and in the sale of shower-baths; afterwards came to Europe as a picture-dealer, then returned to America, became more and more unsettled in his mind, and died by his own hand in January 1848.

But the experiment of Wells, at Boston, fatal as its results were to himself, was not altogether devoid of fruit. W. G. T. Morton had been a pupil and partner of Wells, and afterwards settled in Boston, where he studied medicine and chemistry for a short time under Dr. Charles T. Jackson, and then practised as a dentist. He was the person who introduced Wells to the Medical Society of Boston, and a share of the ridicule attached to the unsuccessful experiment fell upon his shoulders. It appears that the idea of finding some means of extracting teeth without pain occupied the attention of both Morton and Jackson, and was the subject of conversation between them. Morton learned from Jackson the use of chloric ether as a local application to aching teeth. Both had read in Pereira's work on Materia Medica, that the vapour of sulphuric æther was inhaled in spasmodic asthma, chronic catarrh, and hooping-cough, and to relieve the effects caused by the inhalation of chlorine gas. In fact, for these purposes, the inhalation of ether, pure, or medicated with conium or other substances, was a well-known and not uncommon remedy, and had been spoken of by various authors from the time of Beddoes and Richard Pearson * in the latter end of the eighteenth century. Jackson himself had inhaled ether to relieve the irritation caused by accidentally breathing chlorine gas.

Morton's Discovery.—But the merit of first employing the inhalation of ether in such a way as to produce a decided and controllable state of insensibility to the pain of surgical operations, is undoubtedly due to Morton. He first made several experiments on himself, with imperfect success, arising from the great difficulty of procuring ether sufficiently pure; but having at last, on the 30th of December 1846, by inhaling it from a flask through a glass tube, succeeded in making himself unconscious, he determined to try the experiment on the first fit subject that presented himself. So eager was he, that he sent out agents that afternoon to try and tempt some Yankee, with the offer of five dollars, to come and inhale the ether, and loose a tooth. No one, however, would be so tempted; but that same evening the very person wanted came of his own accord. A man, Eben H. Frost by name, applied to have a tooth extracted, and being wonderfully timid, and wishing to be mesmerised in order that he might feel no pain, he was easily persuaded to inhale some ether from a handkerchief. He soon became unconscious, and Morton extracted a bicuspid tooth, the patient knowing nothing of the operation till he recovered his senses, and saw the tooth lying on the floor. A Dr. Hayden, who held the lamp for the operator, and one Tenny, a journalist, were witnesses of the fact, and, together with the patient, immediately drew up and signed a document attesting it. And so, a new era in surgery began with the painless extraction of Frost's tooth by Morton, at 19, Tremont's Row, Boston, at nine in the evening of the 30th of September 1846.*

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* Short Account of Different Kinds of Airs, so far as relates to their Medicinal Use, by Richard Pearson, M.D. Birmingham, 1795.

Morton lost no time in prosecuting the discovery he had made, although he did not at first disclose the nature of the agent employed. He continued to make experiments at his own house; and having made the subject known to Dr. Warren, was permitted to introduce his anæsthetic agent into the practice of genuine surgery, and on the 16th of October administered the ether in the Massachusetts General Hospital, at Boston, to a patient from whom Dr. J. C. Warren removed a tumour in the neck; and on the day following to a patient from whose arm a tumour was extirpated by Dr. G. Hayward. From that time the use of the novel remedy spread rapidly in all directions; but before pursuing its history we must drop a passing word of regret at its disastrous effects on the fortunes of its discoverer. Morton endeavoured to make a mystery of the means he employed, and to secure to himself, by patent, the exclusive right of administering it. But Jackson, seeing that the thing promised to be both famous and lucrative, now laid claim to the discovery as his own, on the plea that certain information which he had given Morton, respecting the properties of ether, had directly led Morton to the use of it. To pacify Jackson, and bar any claims he might hereafter set up, he was allowed a share in the patent which was taken out. Nevertheless he sent a communication to the French Academy, in which he suppressed Morton's name, and claimed the whole discovery as his own. Meanwhile the patent turned out to be good for nothing, and Morton, who had neglected his business, and injured his health by the excitement of his discovery, was left with his pockets empty, and even the bare honour of the invention almost wrested from him.†

From America the news of the discovery was conveyed to England in a communication from Dr. Bigelow, of Boston, to Dr. Francis Boott, and it was received most cordially.‡ On the 21st of December 1846,

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* Ether and Chloroform, by Henry J. Bigelow, M.D. Boston, 1848.

† See a Report of the Trustees of the Massachusetts General Hospital, with a History of the Ether Discovery, in Littell's Living Age, Boston, 18th March, 1848.

‡ Vide Lancet, January 2, 1847, and all the medical periodicals of that year, *passim.*

Mr. Liston tried the ether with the best possible results in a case of amputation of the thigh, and in one of evulsion of the toe-nail. On the 31st, the writer was present when Mr. Fergusson used it in the King's College Hospital, and in less than a fortnight it was tried by almost every surgeon in the kingdom; whilst the medical periodicals for a long time were crowded with fresh instances of its powers in alleviating suffering, and with descriptions of various apparatus for administering the vapour. It was employed in every variety of surgical operation, from the Cæsarian section, in which it was used by Mr. Skey, at St. Bartholomew's Hospital, on the 25th of January 1847, down to tooth-drawing; and in all kinds of painful examination or manipulation; it was used in cases of strangulated hernia and of dislocation and in the obstetric operation of turning, in order to diminish the resistance of the muscles; in various cases of painful and spasmodic affections, such as tetanus, neuralgia, and spasmodic asthma; it was employed to tranquillize the insane, to detect feigned disease, and to diminish the sufferings incidental to parturition. It was used too on infants, on the aged, and on animals. Its *modus operandi* closely resembles that of chloroform, and need not be described separately.

CHLOROFORM.—Brilliant as was the career of the ether discovery, it was destined soon to be eclipsed. Ether, whose chemical symbol is C_4H_5O, is one of a numerous class of bodies, all composed of hydrogen and carbon, with variable proportions of oxygen or some other electro-negative. Dr. J. Y. Simpson, of Edinburgh, believing that amongst these bodies some might be found equal or superior to ether, made many experiments on himself and friends with chloride of hydrocarbon, acetone, nitrous ether, and other analogous substances, and at last, on the 4th of November 1847, in company with Dr. Keith and Dr. Matthews Duncan, found in a heavyish liquid that had been put by and almost forgotten. an agent which was manifestly superior to ether in its narcotizing virtues, and immeasurably more pleasant. This was *chloroform*. It had been investigated some time before by Dr. Glover, and it was recommended to Dr. Simpson by Mr. Waldie of Liverpool; moreover, inhalation of the fumes of that solution of it in alcohol which is known by the name of *chloric ether* had been tried some time before by Mr. Jacob Bell; but undoubtedly the merit of establishing the anæsthetic power of chloroform, as a matter-of-fact, belongs to Dr. Simpson. The surgeons who first performed operations with the aid of it, were Dr. Miller and Dr. Duncan, at the Royal Infirmary of Edinburgh, early in November 1847.[*]

Chemical History.—Chloroform is a terchloride of a hypothetical base, termed Formyle, which consists of two atoms of carbon and one of hydrogen. Hence the symbolic designation of chloroform is C_2H,Cl_3. It was discovered by Soubeiran in 1831, by Liebig in 1832, and by Mr. Samuel Guthrie, of Sacket's Harbour, New York, in the same year;[†]

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[*] Consult Miller's Principles of Surgery, vol. ii., p. 756, for a facetious account of the circumstances attending the discovery.

[†] Cogswell, Lancet, 1847, vol. ii., p. 631; Waldie, *ib.*, p. 687.

its real nature was ascertained by Dumas and Peligot in 1835. It is obtained by distilling rectified spirit with water and chloride of lime, in the proportions of four pounds of powdered chloride of lime, twelve pounds of water, and twelve fluid ounces of rectified spirit. These are mixed and distilled, so long as a dense liquid, which sinks in the water with which it comes over, is produced. It is rectified by agitating it with the strongest colourless sulphuric acid, which if it contain any impurities, such as the empyreumatic oils with which it is liable to be contaminated, at once destroys them by charring, and renders them manifest by the dark colour of the line where the chloroform and acid come into contact. It is poured off and agitated with fresh acid, if necessary, then poured carefully off into a dry stoppered bottle, and shaken with some peroxide of manganese, from which it may be decanted, fit for use.*

Pure chloroform is a dense colourless liquid, having the specific gravity, when quite pure, of from 1·480 to 1·5. It is exceedingly volatile, and boils at about 140°. It has an agreeable sweet fruity smell and taste, and if poured on a piece of blotting-paper and evaporated, ought to leave no oily empyreumatic smell behind. By passing its vapour through a red-hot tube, it is decomposed, and hydrochloric acid is given off, which may be detected by means of paper moistened with solution of nitrate of silver. By such a process Dr. Snow has detected it in the bodies of kittens poisoned by a very minute quantity of it, and in the muscles of a child's leg which had been amputated at St. George's Hospital after inhalation of the vapour.

Chloroform is almost incombustible, thus offering an advantageous contrast to ether, from the explosion of which at least one serious accident happened during its administration.†

Effects on the Animal Economy.—When the vapour of chloroform is received into the lungs, it is absorbed into the blood, and conveyed to the nervous centres and rest of the body, upon which it soon produces very marked effects. These it is convenient to divide into *degrees*, and the division which the writer proposes as the most practically useful, is the following:—The *first*, or slightest degree, corresponds with what may be called exhilaration or slight intoxication. The pulse is quickened, and the whole surface, especially the face and eyes, becomes suffused with red. The current of ideas is vivid and not quite under control; fear is banished; vision, perhaps, unsteady, and the gait staggering; but there is perfect consciousness of all that is going on, and the severe pain of operations is still felt intensely; although that part of suffering which depends on mental apprehension is relieved.

In the *second* degree there is no longer perfect consciousness; the mental faculties are almost abolished; the patient generally neither speaks nor moves, though it is possible for him to do both if spoken to or roused, and he is in a condition of deep drowsiness; it may sometimes be called drunken-drowsiness. All the varieties, too, of intoxication may be displayed, according to the mental peculiarity of the patient. One man is noisy, and inclined to fight; another laughs at jokes of his own making; a woman may weep or talk of her husband or children. But these phenomena are not universal, and are of very short duration; for this degree soon passes into the next, if the inhalation be prolonged, or into the first, if it be discontinued.

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* Gregory, quoted in Ranking's Abstract, vol. xi., p. 231.
† Med. Gaz., 20th Sept. 1850.

In the *third* degree, there is *profound sleep;* all voluntary motion and sensation are at a standstill; the eye is suffused and turned upwards, the *pupil contracted*, and the breathing slow, as in natural sleep. But yet in this degree, the eyelids wink if touched; sneezing is excited by tickling the nostrils; in fact, reflex movements are vividly performed, as they are in sleep; and though the patient lie unconscious, he is not yet sufficiently motionless for severe or prolonged surgical operations.

The *fourth* degree, which may be termed *perfect insensibility* (or *anæsthesia*, if a Greek term is better), is distinguished by the circumstance, that in addition to the profound sleep of the third degree, reflex actions are no longer excited by the nerves of common sensation. The eyeball may be touched freely without winking; the muscles are perfectly relaxed; and it is the *very beginning of this degree*, which it is desirable to produce, for the *commencement* of surgical operations.

The *fifth* degree approaches the condition known as *coma;* it is marked by tendency of the *pupil to dilate;* and slower breathing: if the quantity of vapour be increased, death may occur from coma.

If this account of the increasing effects of chloroform be carefully perused, it will be seen that it belongs to the class of substances of which opium and the various preparations of alcohol are examples. It begins by affecting the mind and consciousness. In its smallest dose it stimulates, then disturbs, then suspends the mental operations. It next diminishes the power of the nerves in receiving and communicating, and of the brain in perceiving sensations, whether arising from causes within the body, or without; hence it diminishes or abolishes the perception, and the existence of pain. It further benumbs that power called the *reflex function* of the spinal cord; the power by which the spinal cord, upon the production of any change in the nerves of sensation, puts into play the corresponding nerves of motion, and this quite automatically and independently of the will or consciousness. This is the power by which irritation of any part causes its muscles to contract. Hence, the torpefaction of this power insures the absence of involuntary movement, and the complete relaxation of the voluntary muscles. But it must never be forgotten that it is this function of the spinal cord which provides for the continuance of breathing; and that if it be altogether abolished, the necessary impulse is no longer given to the respiratory muscles; breathing ceases; the heart stops in a minute or two afterwards,—and life is extinguished.

Thus chloroform, administered to excess, may cause death, as opium does, by a series of changes beginning in the *animal*, or cerebro-spinal part of the nervous system, whereby breathing is *slowly* stopped; whilst the actions controlled by the *vegetative* nervous system, including those of the bowels, womb, and above all of the heart, although somewhat enfeebled, are not greatly affected, till they are at last compelled to cease, by the cessation of breathing.

But if chloroform be administered too rapidly, or if certain imperfectly understood conditions be present, *sudden* death may be the result. We shall discuss this point presently.

Dose.—In speaking of the *dose* of chloroform, it must be remembered that it is not the mere quantity inhaled, without reference to time, but the quantity present in the blood in a given time, which is to be regarded. Patients may be kept under its influence a long time, and thus may inhale a large quantity with safety; but even a small quantity too rapidly inhaled, and insufficiently diluted with air, may be dangerous. When we hear the dose of chloroform estimated by drachms, and are told of a patient who consumed thirty-two ounces in twenty-four hours, we must not forget that it is the actual quantity present in a given time in the blood, and its effects on the sensibility and respiration, that are to be the real guides as to the safety or danger of the quantity administered, and not the mere quantity by measure that is evaporated. Dr. Snow calculated that about twelve minims of chloroform circulating in the blood of an adult produce the second degree of narcotism, eighteen minims the degree in which operations are performed; a little more than thirty suffice to arrest respiration, and thirty-six or thirty-seven to stop the action of the heart. These numbers refer to the quantity actually circulating in the blood at a given time. It is necessary also to bear in mind, that when a patient is inhaling air highly charged with chloroform, the narcotic effects continue to increase, as Dr. Snow pointed out, for twenty seconds, after the inhalation is discontinued, owing to the absorption of the vapour remaining in the lungs. But it seems very certain, that much less is requisite for producing full insensibility in some persons than in others.*

Mode of administration.—Dr. Simpson, the father of chloroformization, uses no apparatus whatever, but a simple handkerchief; and the writer, from his own experience, thinks that this unpretending way is the best in all cases in which the slighter degrees only are required; as, for instance, in common midwifery cases, and in cases in which pain has to be allayed without deep or protracted narcotism. It is equally safe, too, for the profounder degrees of insensibility required for severe operations, provided the administrant uses that degree of care without which no sane person would touch this remedy; but it is rather more wasteful of the vapour.

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* Sibson, Med. Gaz., vol. vi., p. 276; T. Wakley, Lancet, 1848, vol. i., p. 19; Dr. Snow, Med. Times, 31st August, 1850; on Death from Chloroform, London Journal of Medicine, April, 1852; case of Death, Med. Times, Oct. 19, 1852; see also Lancet, Oct. 29, 1853.—Dr. Crisp, Lancet, 1853, vol. i. How shall we ensure safety in the administration of chloroform? By Patrick Black, M.D., 1855; Further Remarks on the Cause and Prevention of Death from Chloroform. By John Snow, M.D., Lancet of Feb. 1856.

The patient should lie down. This is particularly necessary if a handkerchief and not an inhaler be employed. If sitting, the attitude should be such as to allow of the completest repose; but it is much more difficult to narcotize a person sitting. He should be encouraged to be as tranquil as possible, and compose himself to sleep. A napkin should be folded into a hollow cone, and twenty minims of chloroform, by measure, be poured into its apex; then it should be held about two inches from the face of the patient, who should be instructed to begin to breathe through open mouth, slowly and deeply, so as to inhale as much of the vapour as he can. If there is any choking, the napkin should be removed a little further. The narcotism should be insinuatingly begun; so as to avoid any distressing gulping, or choking, or struggling, especially in the case of children. When the first twenty minims are exhausted, the same quantity should be repeated; and this should be done again and again at intervals, till the requisite degree of narcotism is produced. So soon as the eye, when opened, looks suffused and heavy and turned up, and the patient scarcely speaks if spoken to, then the second degree is at its acme, and the third beginning.

If the inhalation be continued, the degree of profound sleep, and next that of complete insensibility, will be established, and then, so soon, as Dr. Snow observes, as the eyelid can be raised, and the conjunctiva touched without winking, the surgeon may begin. When the operation is fairly commenced, it is not necessary to keep up so great a degree of narcotism. The patient having been secured against the first plunge of the knife, may be kept in a sufficient state of unconsciousness by an occasional whiff of the vapour, whenever his countenance exhibits any signs of feeling. In fact, during a protracted administration, when the patient is thoroughly narcotized, the vapour should be intermitted; the patient should for certain intervals be allowed pure air, and the chloroform be resumed from time to time when there is some approach to wincing under the hands of the operator.

If, however, the surgeon chooses an apparatus, a very simple and good one is *Dr. Sibson's mask*. This consists of a mask, covering nose and mouth, constructed of thin flexible metal, so that it can be adjusted to a face of almost any form or size. It has attached to it a small cavity, within which is a piece of blotting-paper, on which the twenty minims of chloroform are dropped from time to time. Through this cavity the air is drawn in by the act of inspiration, bringing the chloroform vapour with it. A valve of vulcanized india-rubber permits the entrance of the air, but prevents its escape by the same route. Another valve opens to allow of the escape of the air that has been once breathed, but shuts during inspiration. This latter valve, if entirely turned aside, permits the atmospheric air to enter freely without any chloroform, or, if removed partially, permits it to be mixed with it in any proportion.

Dr. Snow's Inhaler consists of Dr. Sibson's mask, which is connected by a long flexible tube to a double metallic bottle. The inner bottle contains the chloroform, and has proper apertures for the transmission of air. The outer bottle contains cold water, in order to provide that the vapour may be raised at an equable temperature.

Another rude but very good apparatus is made by folding a piece of very stiff paper into the shape of a fool's cap; leaving an aperture at the top. A piece of sponge is sewed to the inside of the paper near the top; and on this (first wetted with cold water) the chloroform is poured.

Mr. Armstrong Todd has devised a very ingenious instrument, consisting of a tube perforated on all sides, and having a moveable piston, on which last the chloroform is put. By increasing the distance of the piston, the amount of pure air which comes through the perforated sides is increased.

Messrs. Weiss, also, have devised a very good inhaler, more portable than Dr. Snow's, by which the quantity of chloroform and of air can be regulated. But the best of all is one which Messrs. Weiss have shown the author, which is fixed to the operating-table; and which provides against waste of the vapour, and excessive doses.

The following hints may be of use to beginners:—The chloroform should not be allowed to touch the lips, or it may blister them. The patient should not be chloroformed within two hours of a full meal. This precaution may prevent the annoyance of vomiting. He should be narcotized before he is removed to the operating-table, and before he can see any preparations or knives. The humanity of this precaution, if a timid patient is to be brought into the operating theatre of an hospital, is evident. He should be taken back to bed again in a state of unconsciousness. There should be no hurry in the first stage of the process, because complete insensibility to pain, and absence of involuntary movement and wincing, are more safely obtained after the vapour has had time to permeate all the capillaries and benumb all the peripheral nerves. Dr. Snow makes the most valuable observation, that insensibility to pain cannot be obtained in a *very rapid* manner without a dangerous degree of narcotism of the nervous centres. The inhalation should occupy at least from four to seven minutes before the third degree of narcotism is established; and then it will usually be another minute more before the surgeon should begin. The loud talking or violence of the intoxication stage is no cause of alarm; quite the reverse; it shows that the vapour has not produced a dangerous effect, and that a slight increase is necessary to produce the next degree.

At every operation the management of the chloroform should be committed to one competent person, whose duty it should be to attend to it, and nothing else, with his eye on the breathing, and his finger on the pulse.

The *class of patients* on whom chloroform acts most pleasantly and safely are women in childbirth; next, young children, in whom it scarcely ever causes either mental excitement or struggling. Moreover, immunity from pain is obtained with less narcotism of the nervous centres than in adults. The very aged are long in recovering their consciousness after inhalation. The more feeble a patient is, the more quickly and pleasantly does the vapour generally act; if very strong and robust, considerable mental excitement is apt to occur in the second degree of narcotism, and struggling or rigidity of the muscles in the third. Some patients hold their breath for some seconds. In this case, the first deep inhalation should be of pure air only.

The cases in which the inhalation of chloroform is useful comprise, in the first place, every surgical manipulation attended with pain; of which it seems not only to render the patient unconscious, but also, by preventing its effects on the mind, to neutralize its depressing power on the body. To lull the pain during operations as well as the smarting after them; to lull the pain and shock of violent injuries, and of the surgical examination and setting of fractures which follow; to facilitate the reduction of herniæ and dislocations and the passing of catheters, and to detect feigned disease; these are its chief surgical uses. But its benefits are not confined to the abolition of pain; there is great reason for hoping that it renders operations less mortal; it enables the surgeon to proceed with his dissection in a more leisurely manner; it does away with the scruples of the over-modest woman, to whom the shame of exposure is worse than the pain of the knife; and it circumvents the opposition of the timid and unruly.

In *military surgery* it has special uses. "In the prolonged searches," says Dr. Macleod,* "which are sometimes necessary for the extraction of foreign bodies, it not only prevents pain, but restrains the involuntary contraction of muscles which otherwise would throw great obstacles in the way of both search and extraction. In field-practice, too, when a number of men come in quick succession during a general engagement, to be operated upon, the brave fellows who are waiting for their turn are spared the depression which the groans of their comrades under the knife would otherwise inflict upon them."

In the case of *children*, many things can be done nicely with chloroform, which could be but most ill done, if at all, without it. Take, for instance, the case of wounds of the eyelids or eyebrows, which, if not most accurately sewn up, are sure to be followed by frightful seams, or by inversion or eversion of the lids, and perpetual overflow of tears. By a little chloroform, not merely the pain and fright of the injury, and the severe smarting caused by the needle, but the struggles also, which render quickness and nicety of adaptation impossible, are done away with; the patient sleeps tranquilly during the process, and wakes composedly soon after, absolutely without any ill consequences whatever. The writer administered it day by day for a fortnight to a child of four years, who had been severely scalded, in order to prevent the screams and struggles which accompanied the dressing of the wound. No ill effects whatever resulted. The child slept through the dressing, and awoke without sickness.

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* Notes on the Surgery of the War in the Crimea. By G. H. B. Macleod, M.D., F.R.C.S., &c., Lond. 1858.

But the uses of chloroform are far from being confined to the practice of surgery. In midwifery the uneasiness and spasms which attend the early stages, and the distension and rigidity of the later, together with the anxiety and fears, are so tranquillized that, although fortunate and healthy women need it not, yet those who have ever experienced the comfort of it, are never willing to forego it in another confinement. Moreover, in ordinary cases, its good effects may be óbtained with the smallest doses, without scarcely passing the first or second degree of narcotism, and without the slightest danger at the time, or ill effect on mother or child afterwards.* In the operations of midwifery its effects are admirable; and not the least happy circumstance is, that it works so well with opium. In general physic its use is great; not so great, perhaps, as the writer was led to hope in preceding editions of this work. In the last edition we said, "In general terms, it may be said to achieve perfectly, and at once, what opium is an hour or two in doing gradually. Moreover, it has the happy property of being so quickly and entirely eliminated from the system, that there are in most cases no ill effects afterwards; none of the checked secretions for which opium is, justly or unjustly, so often blamed. Hence, in violent pain and spasms, especially in colic, in spasmodic asthma, and spasmodic cough, dyspnœa, dysuria, dysentery, dysmenorrhœa, and almost every other compound of δὺς, in hysteria and convulsions not depending on fulness of the nervous centres, this remedy may be resorted to. In the violent colic of infants, for example, the sagacious physician, instead of letting the patient shriek itself to death, whilst he is waiting for the effect of remedies, will, by this vapour, stop the pain, which is the element of danger, and remove the causes of the illness radically at his leisure."

Increased experience compels the writer to say, that although his former opinion stands good with regard to cases of sudden painful illness, in previously healthy persons, yet that it is not eliminated quickly; and that it often leaves a deadly amount of sickness and headache, and feverishness, which are great drawbacks to its use in cancer, neuralgia, and dysmenorrhœa, cases in which the writer has tried it.

Cases in which it is inapplicable.—It is generally considered better not to use chloroform in cases of extraction of cataract, in elderly persons. There are two reasons for this. First, lest the vomiting which often happens afterwards might force out the whole contents of the eyeball. But Mr. Haynes Walton has shown that this accident may be prevented if the proper amount of gentle pressure be exerted on the eyelids by means ot strips of plaster. Another more serious objection, is the interruption which chloroform may possibly occasion to the functions of the stomach in aged persons. In operations on the jaws, or fauces, there is no serious fear that the blood will run into the glottis and suffocate the patient, provided the patient's head be turned on one side repeatedly to let it run out freely. Full narcotism should be induced before these operations, and it should be kept up as well as it can by inhalation at intervals from a sponge wetted with cold water, on which twenty minims of chloroform have been poured. The cases in which on general principles it should be given with hesitation, are those of chronic organic disease of the brain, atrophy or dilatation of the heart, and embarrassed circulation through the lungs. But since the shock of an operation is in itself extremely formidable to patients so affected, it is probable that a cautious administration of the anæsthetic might diminish the danger instead of adding to it. Epileptic patients are liable to have their fits induced by the inhalation. It should never be given to a woman without a witness. Moreover, it never should be administered by any person to himself, nor yet be used as a plaything or a luxury. If pain is bearable, and not injurious, let it be borne.

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* The writer has an Essay on the Causes, Varieties, and Prevention of Pain in Labour, which he hopes to publish ere long.

Accidents from Chloroform.—The commonest is vomiting, which, however, is of very little consequence. If it occur during the inhalation, the patient's head must be turned to one side to let the vomited matter escape. If very troublesome afterwards, a little brandy and soda water, or an aperient, may be administered. The patient, if chilly, should be wrapped up warmly. When the patient is an adult, and particularly if old, the chloroform may not be entirely eliminated for some hours, and may occasion nausea and giddiness, and haunt the patient disagreeably with its smell and taste. Abstinence from food beforehand will diminish, but will not infallibly prevent vomiting in all persons; since it is either an eliminatory act, for the purpose of purifying the blood, like the vomiting on the day after a debauch, or else, like sea-sickness, the result of brain disturbance. The prolonged insensibility, and other frightful symptoms which affected some persons, especially young women, after inhalation, when the remedy was a new one, were probably due to hysteria.

Death from Chloroform.—That a remedy so powerful should be capable of extinguishing life, follows as a matter of course from the details which we have given. The *manner* in which life is extinguished has been the subject of controversy, and is probably not always the same: nor yet always simple; but may combine more than one mode of dying.

In the first place, chloroform may kill by apnœa, or suffocation; by interfering with the passage of the blood through the lungs; by giving the blood such a quality that the pulmonary capillaries refuse a passage to it; or by acting upon the medulla oblongata in such a way as to stop the reflex act of inspiration. This mode of death seems to occur often in the case of animals poisoned experimentally; sometimes in man. Possibly spasm of the glottis may be produced by a concentrated vapour. In such a case, the symptoms would be those of "congestion of the head and face, staring eyes, turgid veins, struggling, or convulsive spasms, ineffectual efforts to expand the chest," preceded by a sense of choking, and irresistible propensity to struggle against further inhalation. After death, congestion of the lungs, and fulness of the right side of the heart would be found.*

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* We quote almost verbatim from Dr. Black's very able pamphlet.

There is a capital experiment recorded by Dr. Chapman,* in which the heart of a cat poisoned by chloroform, full and motionless, was set beating by the loss of blood which ensued from division of the aorta and pulmonary artery, and beat for an hour and a half. Hence it is evident that this heart was stopped because overloaded, and unable to force the blood through the lungs: not paralysed intrinsically.

But, *secondly*, there can be no doubt, that chloroform usually kills man by syncope or angina, that is, *paralysis of the heart*. And the order of phenomena is usually this:—The patient all at once raises his body and struggles, the face is noticed to be deadly pale and the limbs relaxed, blood ceases to flow from cut arteries, no pulse is felt at the wrist, the heart cannot be felt to beat, the breathing continues slowly and gaspingly for half a minute or more, then all is over.

Of deaths belonging to this category, no better example can be given than the following:—A gentleman, aged 73, with intermitting pulse, and arcus in each eye, had been chloroformed six or eight times for the purpose of undergoing lithotrity. On Dec. 4, 1851, he was again chloroformed; during the operation he exhibited considerable faintness, though he recovered himself before it was over. A few minutes after the operation he had what was described as alarming syncope. Spite of this, the patient was chloroformed again on the 15th and 19th Dec., by Dr. Snow; whose large experience had given him no room to anticipate bad results. On Sept. 15th, 1852, there was occasion for another operation. Chloroform was again given by Dr. Snow. The patient became insensible in three or four minutes, without struggling. The operation was begun. A little of the vapour was given twice or thrice to keep up the effect. After a few minutes great paleness of lips and face were noticed; but immediately afterwards the face reddened, and the patient strained as though he felt the operation. Hereupon, a little more vapour, largely diluted, was given. But now after two or three inspirations the breathing ceased. It seemed as though the patient were holding his breath a little, as sometimes happens; but on feeling the wrist there was *no pulse*. In a few seconds came one deep inspiration;—a few rapid and feeble pulsations of the heart were heard, which then ceased; one or two very faint inspirations followed at the interval of a quarter of a minute; then death. Cold affusion and artificial respiration were employed without avail. On inspection the heart was found large, soft, friable, and in a state of fatty degeneration.

That death in this, and in other similar cases, is brought about by paralysis of the heart, and not by suffocation, was successfully shown by the late Dr. Snow. He showed that death from pure suffocation is never so quick as death from chloroform has always been; that in cases of death from privation of air, the heart goes on beating for some few minutes after breathing has ceased; whereas, as a matter of fact, in most cases of death by chloroform, the breathing has been proved to go on up to the time the pulse stopped, and after it;—that patients have breathed it freely without struggling up to the instant of death; and that sudden paleness is a more frequent phenomenon in these cases, than turgescence of the face; although neither is incompatible with palsy of the heart. The writer may add, that in the only case in which any unpleasant symptoms occurred whilst he was administering chloroform, the patient complained afterwards, not of choking, but of the unmistakeable symptoms of *angina*,—fixed pain, great oppression, and feeling as of a load in the region of the heart.

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* How Chloroform Kills, Med. Times, 18th Oct., 1850.

Thirdly, chloroform may cause death by what the French call by the classical term *sideration*, to wit, a star-struck or blasted state of the nervous system; or, in plain English, by a sudden annihilation of the life of the brain and spinal cord. Hence the syncope may be caused by the state of the brain, and not merely by the direct action of the poison on the heart. That the poison has an injurious operation on the nervous centres, is manifest from the nature of the thing, and from the vomiting.

In an uncertain number of cases, too, chloroform may have added to the general exhaustion, which has caused patients to sink from the shock of operations.

Yet all the accounts concur in establishing the fact that in the infinitely greatest number of cases in man, it is by direct paralysis of the heart that death is produced.

A remarkable circumstance is the *apparent* capriciousness of the accident. It has been suggested that in some cases the chloroform has been impure; but of this there is no proof.

In others, that the patient's heart was weak, or in a state of oily degeneration. Yet in some cases after death the heart has been found quite sound.

In others, that the vapour was given from a handkerchief, and not with an apparatus. But the writer does not hesitate to say, that if the administrator keeps one eye on the breathing and a finger on the pulse, a handkerchief is quite as safe as an inhaler, or safer, provided that but little chloroform be put on at a time. It is worth noticing that Mr. Todd, the inventor of the ingenious inhaler of which we have spoken, describes Snow's as imperfect and deceptive.

In other cases, again, it has been suggested that the administration was hurried, or careless. And this is no doubt true. The administrator, puzzled or annoyed by the persistence of the second or intoxication stage, gives a sudden increase, and the heart stops.

But the same apparent capriciousness attends most other instances of sudden death. We do not always know, why any given soft and thin heart should stop suddenly at a given time; but we do know enough to put us on our guard.

In the first place, our object should be, to obtain the greatest effect from the smallest quantity, and to avoid sudden increase. Then, to avoid all circumstances which disturb the heart; and, above all, mental agitation. The sitting posture is to be avoided. The patient should be as nearly as possible under the circumstances that induce sleep. Some good soup should be given an hour before, and some brandy just before the operation. Account must be taken of exposure to cold and loss of blood during long operations. The air which reaches the patient should be pure; and lastly, if the pulse be very soft, and the heart's impulse feeble, and the patient subject to breathlessness on slight exertion, it will be wise to give enough merely to abate mental disquietude, without entire insensibility.

Moreover, the writer suggests the previous administration of morphia, as in midwifery, so as to produce a certain amount of sleepiness before the chloroform is administered.

The *signs of danger* of narcotism from protracted inhalation are, respiration too slow, or pupil dilating, or pulse very feeble. The remedies are pure air, cold affusion, and stimulants by mouth or rectum. But supposing that symptoms of *heart-failure* show themselves? The ordinary plan is, to excite the respiratory acts by opening the windows and dashing cold water on the face; by pulling the tongue forwards, so as to unstop the glottis; by inflating the lungs from mouth to mouth; or by forcible compression of the chest and abdomen once in three or four seconds; injecting brandy and beef-tea into the rectum; and holding ammonia to the nostrils. Moreover, Dr. Chapman's experiment, in which the distended heart of an animal was set beating by loss of blood would suggest the propriety of opening the jugular vein, and letting some blood flow, especially if the face were turgid. At all events the efforts should not be hastily abandoned. But since it is the *heart* that requires stimulation—necessary as respiration is—the author would not hesitate to stimulate it *directly* by pricking it with a fine needle plunged rapidly twice or thrice through the sixth intercostal space. There could be little danger in this, under any circumstances: fine needles, in the days when acupuncture was in vogue, were run in everywhere without harm; and in such a case as the present it would be quite justifiable. Besides this, Dr. Sibson has suggested to the author, in conversation, the expediency of injecting into a vein, towards the heart, some stimulating liquid. The heart will beat a long time in warm water: and the injection of warm water with a little salt, or of pure fresh blood from the veins of a bystander, would be a most desirable experiment.

The *number of deaths* caused by anæsthetics has been computed by Dr. Chapman at 74, up to Dec. 1858.* During 1858, and the first six months of 1859, fourteen cases are reported from all parts of the world; two from the American continent; one from Germany; six from France; two from Scotland (in which the chloroform was given without medical aid, during labour); two in the provinces in England; two in the Royal Ophthalmic Hospital, Moorfields. Dr. Chapman calculates that anæsthetics have been administered to 1,200,000 persons for surgical purposes in the whole civilized world during the last ten years, and that one in 16,216 has lost his life thereby.

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* Westminster Review, Jan. 1859. Deaths from chloroform, sixty-eight; from ether, two; from mixture of chloroform and ether, one; from mixture of chloroform and alcohol, one; from amylene, two. We believe that Dr. Chapman overrates the number of operations, and underrates that of the deaths. Perhaps one in eight thousand is nearer the truth.

Now comes the very serious question, *Has chloroform, on the whole, increased the mortality of operations?* Dr. James Arnott asserts that the mortality of amputations has increased from 21 to 34 per cent. since the introduction of chloroform, and in consequence of the use of it. Mr. Fenwick shows that in the Newcastle Infirmary, the gross mortality is the same before and since; to wit, 24 per cent.: but that, if like be compared with like, the mortality of amputations from disease has been reduced from 19 to 13 per cent.; and from injury, to 31 instead of 32. Mr. Coates of Salisbury, in a pamphlet, the candid and practical tone of which renders it of the greatest authority, declares that the mortality of amputations at his hospital in six years under chloroform, has been 9·259 per cent.; in the six previous years 22·58.

But it must be confessed that this question is a most large and intricate one, and that the solution of it demands a most minute analysis of the facts. We do not know yet, whether, comparing like things with like, the mortality has or has not increased; and if it has, whether the increase is due to chloroform. But it is very unlikely.

CHLOROFORM COMPARED WITH OTHER ANÆSTHETICS.—Very many experiments have been made on substances analogous in composition to chloroform, and on various combinations of them. *Ether* is much less pleasant than chloroform, more irritating to the air-passages, and more apt to be followed by headache and other unpleasant symptoms, of which the persistent taste and smell of it in the breath are not the least. But it is much safer, less rapid in its action, and only one-third as powerful. Besides, it produces complete muscular relaxation more perfectly, so that it is perhaps preferable in cases of hernia, dislocation, and spasm. The *Dutch liquid*, or compound of chlorine and olefiant gas, so called because discovered by the Dutch chemists in 1795, resembles chloroform in its general effects, and is only about one-half so powerful or rapid in its action. It is not easy to procure. A mixture of equal parts of chloroform and alcohol is said to be safer, but has caused death in America. *Amylene*, a liquid hydro-carbon, was used by Dr. Snow in 238 cases: its anæsthetic powers were satisfactory, and it caused vomiting in two only out of the 238 cases, although chloroform caused it in 22 per cent. But its odour is abominable, and it destroyed life in two out of the 238 cases. *Bisulphuret of carbon* is a powerful, but uncertain and disagreeable agent.

Undoubtedly, of all anæsthetics yet discovered, chloroform is the best. But we are not necessarily committed to it; and other means may yet be found to induce perfect local with slight central anæsthesia. It is even not impossible that we may yet go back to the experiment of Beddoes, with his reservoirs. Dr. H. Bigelow, of Boston, removed a breast, with the aid of sixty quarts of nitrous oxide gas, "consumed during six minutes, and producing a most tranquil and complete insensibility."

MEANS OF PRODUCING LOCAL ANÆSTHESIA.—Something is desired which shall produce perfect insensibility of the part to be operated on, and yet leave the brain in possession of its faculties. Very many experiments to this end have been made by Dr. Simpson, who has found that the strongest preparations of opium, aconite, belladonna, tobacco, and Indian hemp produce no appreciable insensibility when applied to the human skin: and although prussic acid rubbed on the gums, and the vapour of chloroform applied continuously to the skin, produce some numbness, yet still they are not sufficient to render a cutting operation, or the extraction of teeth, painless. Galvanism and electricity have been tried, and failed; and a combination of narcotic applications with galvanism has been tried by Dr. Richardson, with very unsatisfactory results. A small quantity of chloroform put into a spoon, and evaporated over a candle, will allay the pain of an ulcer. But the only efficient local anæsthetic we are at present acquainted with, is

INTENSE COLD, the properties of which have been explored by Dr. James Arnott. The writer has witnessed his mode of applying it, and has applied it himself, thus:—

The operator must be provided with about a quarter of a pound of ice, broken quite fine, which may be effected by putting it into a small canvas bag, and using a mallet or flat iron. "The pounded ice having been placed on a large sheet of paper, any loosely cohering particles may be separated by a paper-folder, and the unreduced larger bits removed. Beside it, on the paper, about half its weight of powdered common salt is placed, and they are then thoroughly and quickly mixed together, either by the folder while on the paper, or by stirring them in a gutta percha, or other non-conducting vessel. If the mixture be not quickly made, the extreme cold of part of it may again freeze other parts of it into lumps." There must be in readiness a small net of thin gauze, into which the mixture is put; and as soon, says Dr. Arnott, as the action of the salt upon the ice appears by the dripping of the brine, it is ready for use. The part to be benumbed should be held horizontally, and the net should be laid over it; but it is as well to raise the net once in every three or four minutes, in order to watch the effects, and render them equal. A sponge should be held so as to catch the briny fluid that escapes. The process requires a little nicety, which one or two trials will give.

If it be nicely performed, it makes the skin immediately pale and benumbed, but gives no disagreeable sensation. This effect gradually increases, till the skin is shrunk, of a peculiar tallowy corpse-like paleness, perfectly insensible, and stiffish. Dr. Arnott believes that, by protracted application of the ice, the fat is congealed. The process, as the author can testify, is rapid and painless; and when the effects of the cold have passed off, if the part be bathed with cold or iced water, or covered with a bladder containing it, there will be very little tingling or inflammation; possibly a little redness.

Unquestionably, if the application be continued for an unreasonably long time—say for an hour or two—or if heat be incautiously applied too soon afterwards, the same effects may ensue as those which we have described at p. 155, under the head of frost-bite, particularly if the patient be of a bad or weakly constitution. But the moderate and judicious use of cold is followed by no ill consequence whatever, and it seems to promote the process of healing.

As an anæsthetic remedy, it appears amply sufficient, and well adapted for most of the minor operations, such as those on small tumours, abscesses, warts, inverted toe-nails, fistula, piles, varicose veins, application of the actual cautery, formation of issues, and the like. For extensive and deep operations, and those in which perfect quiet is requisite, it is insufficient.

Besides its use as an anæsthetic before operations, it has been employed to check the growth of cancer and nævus, and to assuage the pain of boils, carbuncle, gout, and neuralgia. The writer has used it in whitlow, and it gave relief to the pain, but did not hinder the formation of matter.

For the application of the freezing mixture to ulcerated surfaces, a fine India-rubber bag or gut may be used. Dentists employ a modification of a process invented by Dr. James Arnott, for passing a stream of water of any temperature through a membranous bag over a diseased part. In the apartment over the operating-room is an apparatus, by which at first a stream of water of the temperature of the body, and then a saline solution, gradually cooled down to about 15° of Fahrenheit, or lower, is made to pass through an India-rubber tube. At one part of this tube there is inserted a tube of the thinnest possible India-rubber, which is wrapped around the condemned tooth and the adjoining gum, and through which the cold current acts upon those parts. The writer has seen the process conducted by Mr. Quinton, and can testify that the success of it was complete; that is to say, it occasioned no pain itself, and it allowed a tooth to be pulled out without suffering. The gum was blanched, and did not bleed, but the tooth, and inside of the socket did. Rinsing the mouth for some time with cold water takes away all unpleasant consequences. The writer's objection to the process is, that it is more troublesome than the result is worth; especially if many teeth are to be operated on.*

MESMERISM.—There is no doubt but that the manœuvres which are called mesmeric passes, if practised long enough upon susceptible persons, are capable of producing a kind of cataleptic condition accompanied with insensibility to external impressions, and that in this state surgical operations have, in many instances, especially amongst the natives of India, been performed without the patient's consciousness.

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* See Dr. James Arnott's pamphlet on benumbing cold as a preventive of pain and inflammation from surgical operations, with minute directions for use, 1854. Pamphlets by Mr. Quinton, Mr. Blundell, and others on Anæsthetic Dentistry. Mr. Butcher, in his Observations on Hare-Lip, Dublin, 1856, speaks briefly on the use of cold, but complains that it causes pain in the case of children with hare-lip; as much pain as the operation itself. Possibly the process requires Arnott's current apparatus.

But ample objections to mesmerism, as a medical agent, may be gathered from the works of its advocates. The writer has most carefully analyzed the works of Dr. Esdaile, a surgeon of great experience in India; in which it is asserted, 1st, as to the *nature* of mesmerism:—"That it is the transmission of nervous matter to the brain of the patient from the brain of the agent, through the nerves of the latter." Which is nowhere proved. 2ndly, as to the *process*:—That it consists in touching some part of the patient's body, breathing on it, and making stroking movements, called *passes*; but it is alleged that the *intention* or *will* of the operator is the chief agent, no matter how the passes are made. 3rdly, as to the *effects*:—That they consist of various degrees of insensibility, delirium, and muscular rigidity; during which it is asserted that the patient is completely under the control of the operator; his bodily sensations, his actions, and his very thoughts being exactly those which the mesmerizer may *will* his passive victim to experience. We do not mention certain other alleged phenomena, such as the power of seeing without eyes, of prophesying, &c. &c., which do not concern us.

On the other hand, there is the admission, 4thly, that mesmerism is only one of six powers, each capable of producing the same effects on mind and body; the other five being—religious fanaticism—exhaustion of the brain by long contemplation—exhaustion of any one organ of sense—narcotic medicines—and last, not least, *hysteria*. Where so many known causes exist to explain the phenomena of mesmerism, it seems unnecessary, to say the least, to go out of our way to imagine a transmission of nervous power. It is confessed further by Dr. Esdaile, 5thly, that all the *mesmeric* phenomena, like the *hysteric*, if once induced, may occur in paroxysms, without any mesmeric passes, whenever *willed* by the patient, especially if the nervous centres have been rendered morbidly sensitive by the mesmeric process.

If these things be properly weighed, and if the reader consider further that the mesmeric state (or in plain English hysterical catalepsy), is one which cannot be induced in persons of sound vigorous mind; that, if free from all objection, it could seldom be available at the time and place requisite; and that it is confessed that a person susceptible of it is, to use Dr. Esdaile's words, "at the mercy of any foolish or unprincipled person,"—he will agree with the writer, that it has no claim to be received into the rank of therapeutical agents. "It is often," says Dr. Esdaile, "very difficult and laborious to excite the mesmeric action in the constitution; but being once felt, a very slight recurrence to the original process will often bring on the mesmeric paroxysm; and if the excitement of the nervous system is kept up by frequent mesmerizing, an independent diseased action is set up in the constitution; we have, in fact, inoculated the system with a nervous disease, acting spontaneously, and obeying natural laws we do not understand."*

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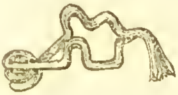
* Esdaile on Natural and Mesmeric Clairvoyance. Lond. 1852, p. 235. Introduction of Mesmerism into the Hospitals of India, 1852, p. 42. Brierre de Boismont on Hallucinations, by Hulme, p. 216.

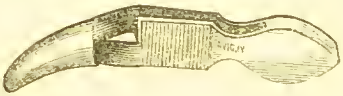
CHAPTER III.

THE MINOR OPERATIONS.

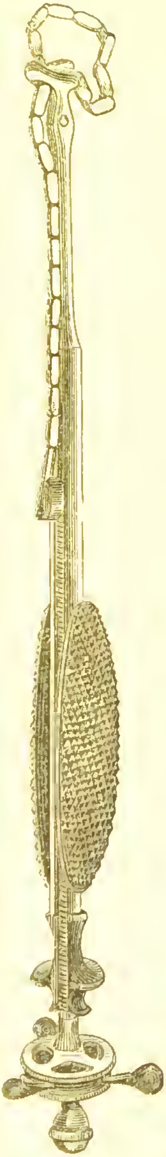
I. Extirpation of Tumours.—A different proceeding is to be adopted in the case of cancer and of other growths. In the former it may be necessary to remove a portion of skin by two semi-elliptical incisions, if it appear to be contaminated by the diseased growth. But in extirpating wens or fatty or fibrous tumours, however large, it is a general rule not to remove any of the skin, unless it is much inflamed or ulcerated, or so entirely adherent to the tumour that its separation would be very tedious and difficult. Again, in the former case, it is necessary to cut quite wide of the diseased mass, and remove plenty of the surrounding tissue; in the latter case the incisions should be carried through the cellular cyst of the tumour. Then after a free incision through the cyst, the tumour may often be squeezed or twisted out, and its connections be torn, with the assistance of one or two touches of the knife.

In all cases it is a better plan (unless the tumour is exceedingly large) to carry the dissection at once boldly to the deepest part where the largest vessels enter than to tie the different branches as they are divided, by which means some vessels may perhaps be tied more than once. Again, it is requisite in every case that the extirpation be complete, because if the smallest portion is left, it may become the nucleus of a fresh growth. If, therefore, it is found that there is any portion of a tumour which cannot be cut out without fear of dangerous hæmorrhage, a double ligature should be passed through its base, and be tied tightly on each side of it. The *serrefines* of wire and the small forceps here depicted, which hold on by their own elasticity, may be of service to check bleeding in extensive operations.





II. The Ecraseur.—As the act of biting the umbilical cord by an animal is to the cut of the knife or scissors, so is the effect of this instrument to that of the knife. It is a machine, consisting of a fine chain (perhaps wire or whipcord), and of a screw or rack for tightening it; so that when the chain is made to surround any tumour it is made slowly to crush or bite its way through. The advantage of the instrument is, that it causes little or no bleeding. The cases in which it is applicable



are those of cancer of the tongue, piles, polypes and other tumours of the womb and rectum, and the division of the pedicle of an ovarian cyst. In the case of a tumour with a pedicle, its application is easy; if the mass is solid, or it is desired to extirpate a portion of the side of the tongue, for example, the chain may be passed through the centre and be made to cut one line of a V incision first, and the other afterwards. Or two instruments may be used together. The ecraseur was invented by M. Chassaignac, and introduced into England by Mr. Price.

III. VENÆSECTION at the bend of the arm should always, if possible, be performed in the median-cephalic vein. A ligature being placed a little above the elbow (but not tightly enough to stop the pulse at the wrist), the operator takes the forearm in his hand, places his thumb on the vein a little below the intended puncture, and then (using the right hand for the right arm, and *vice versâ)* pushes the lancet obliquely into the vein, and makes it cut its way directly outwards. When sufficient blood has been taken, the surgeon should untie the ligature above the elbow, and place his thumb on the bleeding aperture. Next he should put a little bit of lint on the wound, and secure that with a strip of plaster, only removing his thumb sufficiently to admit of the application. Then he should remove his thumb enough to put on a little square compress of linen, and over that the middle of a bandage. This is to be passed round the elbow in the form of a figure of 8, and the two ends are to be crossed and turned backwards over the com-

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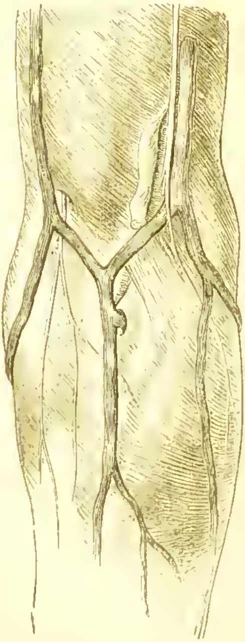

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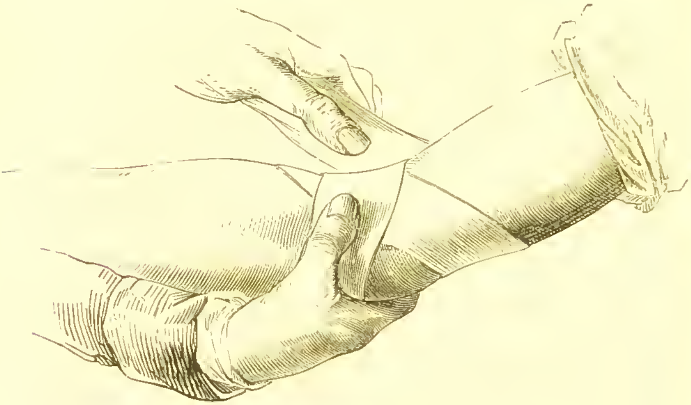
* This cut shows the veins of the bend of the elbow, together with the relation of the brachial artery to the median basilic vein.

press. The next figure is intended to show the way in which the surgeon should grasp the arm, and keep his thumb over the bleeding aperture till the bandage is secured.



The jugular vein is sometimes opened in cases of apoplexy in adults, and in children if the veins at the elbow are hidden by fat. The patient, if a child, being laid in a nurse's lap, with his head towards the surgeon, the latter puts his left thumb on the vein a little above the clavicle, and then opens it with a lancet, cutting towards the thumb, and in a direction downwards and inwards, so that the incision may cross the fibres of the platysma. When blood enough has been taken, the wound should be closed with lint and plaster, and not till then should the thumb be removed.

The veins in the leg, scrotum, or neighbourhood of the eye or ear, can readily be opened in the same manner, instead of the ordinary mode of venæsection, or leeching, or cupping.

Abscess in the areolar tissue, inflammation of the fascia, phlebitis, neuralgia, varicose aneurism, and aneurismal varix, are occasional ill consequences of venæsection.

IV. ARTERIOTOMY.—The temporal artery should be opened above the outer angle of the eyebrow—not just above the zygoma. The surgeon feels for the largest branch, steadies it with two fingers, one placed above, and the other below, the intended puncture—then pushes in the lancet in the same manner as in venæsection. The incision should be directed across the vessel, and should cut it about half through. When sufficient blood has flowed, the best plan is to introduce the lancet, and cut the vessel completely across, so that its ends may retract. A firm graduated compress should then be applied, and be confined with a bandage passing round the head; and some degree of pressure should be kept up on the wound for a week or ten days. Any subsequent bleeding or spurious aneurism must be treated by completely dividing the artery, if it has not been done already, and by pressure; but if the wound is much inflamed or ulcerated, so as not to admit of pressure, a transverse incision should be made on each side of it, and the artery be tied in both places.

V. CUPPING.—The patient being placed in a comfortable position, with towels arranged so that his clothes may not be soiled by the blood, and being moreover protected from cold, so that the flow of blood to the surface may not be checked, and the operator having his scarificator, glasses, torch, spirits of wine, lighted candle, hot water, and sponge, conveniently arranged on a table close by; the first thing is to sponge the skin well with hot water, so as to make it somewhat vascular. The operator next dries it with a warm towel, and adapts his glasses to the part. Their number must depend on the quantity of blood to be taken—from three to five ounces is a fair calculation for each glass. In the next place, he dips the torch in the spirit, sets it on fire, introduces it for half a second into one of the glasses, and immediately claps the latter on the skin—and the same with the other glasses in succession. As soon as the skin has become red and swollen, he charges the scarificator, and takes it between his right forefinger and thumb, at the same time holding the lighted torch between the little and ring fingers of the same hand. He then detaches one glass by insinuating the nail of his left forefinger under its edge—instantly discharges the scarificator on the swollen skin, and as expeditiously as possible introduces the torch into the glass and applies it again. The same process is repeated with the other glasses. When they become tolerably full, or the blood begins to coagulate in them, they must be detached in succession and reapplied, if blood enough has not been taken—and when the operation is finished, the wounds should be closed with lint and plaster. There are several points connected with this operation that require notice. In the first place, the glasses must not be exhausted too much; if they are, the pressure of their rims will occasion severe pain—the blood will not flow—and the operation will very probably be followed by a considerable ecchymosis. Secondly, the position of the glasses must be slightly varied each time they are applied, so that their edges may not again press on the same circle of skin. Thirdly, the expediency of not burning the patient need scarcely be hinted at. Fourthly, in taking off the glasses, the upper part of each should be detached first, so that the blood may not escape. Lastly, the length of the scarificators must be adjusted to the thickness of the skin; for if the incisions are too deep, the fat will protrude through them, and prevent the flow of blood. The direction of the incisions should correspond to the course of the muscular fibres beneath; but this is of no great consequence. For *cupping on the temples* smaller glasses and scarificators are employed. A branch of the temporal artery is generally wounded, and the flow of blood may be expedited by slightly lifting the lower part of the rim of the glass.

Pressure should be kept up on the wounds for some days afterwards, in order to prevent secondary hæmorrhage or false aneurism.*

VI. Transfusion of Blood.—This is an operation which may be performed in two sets of cases. In the first place, whenever death seems imminent from profuse loss of blood; especially after flooding in labour; after operations, wounds, and injuries of all kinds, and the bursting of varicose veins. In every such case, it is the surgeon's positive duty to perform this operation. Secondly, there are some cases in which death is creeping on from slow starvation through disease, such as cases of cancer, and of any other organic disease that is causing exhaustion, in which it may be a question to be decided by the patient whether the attempt shall be made to prolong life for a few days or even hours. Besides these cases, the surgeon may think it expedient in cholera, to inject water containing the saline constituents of the serum.

In flooding and other sudden accidents it will almost certainly happen that no elaborate apparatus is within reach, and the surgeon will have to use whatever he can lay his hands on. It is consolatory therefore to know that most of the successful cases of transfusion have been performed with common pewter or brass syringes.

The operator must of course find some healthy person who is charitable enough to spare some of his blood. Then supposing that he has nothing but a common syringe, he must immerse it in hot water, and thoroughly rinse it out so as to cleanse it from dirt.

The next thing is to open a vein in the patient's arm, or if there is no prominent vein there, in the leg. It may, if large, be opened with a lancet, as in venæsection, and then a probe be passed into it, to serve as a director for the nozzle of the syringe. The probe ought to pass up freely along the canal of the vein. If there is any difficulty, an incision an inch and a half long should be made over a vein, which should be gently raised on a probe passed under it, and be opened sufficiently.

The operator next takes out the piston of the syringe. Then, the arm of the person who is to give the blood having been, meanwhile, bound up, he opens a vein freely, and catches the blood in the syringe, closing the nozzle with one forefinger. When he has taken as much blood as the syringe will hold, he desires the blood-giver to put his finger on the wound to stop the blood; then puts in the piston, holds the syringe with the nozzle upwards, presses the piston so that all air and a little blood may escape, then, whilst a little blood is escaping, he inserts the nozzle into the vein, and gently drives in the blood. Three or four ounces may be injected twice, or thrice, at intervals, according to the effect produced.

If the surgeon has time for choice of instruments and for a deliberate operation, he may use the very ingenious apparatus invented by Mr. Whitehouse, of Brighton, constructed by Weiss, and here depicted. It

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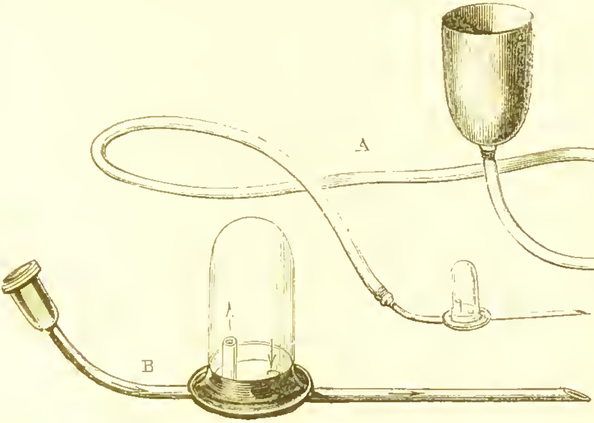
* Messrs. Weiss have shown the writer a French instrument, *ventouse*, as it is called, in which an elastic suction-bottle, with valves, is used to exhaust the air. It appears to be very efficient, and much less troublesome than the torch and spirit of wine apparatus, as the amount of suction can be regulated with the greatest nicety.



consists of a cup of glass or of metal plated, a flexible tube A, and a tube B, which is to be inserted into the vein. This last has an *air-trap* connected with it, so constructed that any bubbles of air would be detained in it, and be rendered visible to the operator. The blood is received into the cup, and allowed to fill the flexible tube and air-trap (which is emptied of air by being turned upside down), then the nozzle can be inserted into the vein. By raising the cup the force of the stream is increased, and it can be stopped in a moment by the finger and thumb of the operator.*

VII. Acupuncture is easily performed by running in five or six needles with a rotatory motion. It is certainly very efficacious in some cases of neuralgia; but it is by no means easy to explain its operation. Acupuncture is also resorted to in anasarca, when the skin is much distended; and we have spoken of its utility in hydrocele, ganglion, hydrothorax, and ascites, for the purpese of permitting the serum to exude into the cellular tissue.

VIII. Issues may be made by caustic, or by incision, or by the actual cautery. The first may be made either by rubbing a portion of skin of the requisite extent with the potassa fusa, or by making a paste with equal parts of the potass and soft soap, and laying it on the skin till the latter is converted into a black slough. The parts immediately around the issue should be protected with several layers of sticking-plaster. After the application of the caustic, the part should be poulticed till the slough separates, and then the sore may be prevented from healing, either by binding several peas firmly on its surface, or by touching it occasionally with the caustic. The second species of issue is made by pinching up the skin, and slitting it up with a lancet, and then introducing some peas to prevent it from healing. It may be remarked, that issues should never be made over projecting points of bones, nor over the bellies of muscles, for they might degenerate into most obstinate sores. Thus, for diseased vertebræ, the issues should be made between the spinous and transverse processes; for diseased hip, *behind* the great trochanter, and not over it; for diseased knee, just below the inner tuberosity of the tibia. Issues, if indolent or irritable, should be healed up. They are only of use, says Mr. Vincent, when the actions carried on in them are vigorous and healthy.

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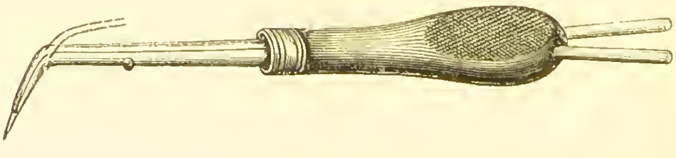
* The writer has to thank Mr. Whitehouse for much valuable information on the subject of this instrument. It may be mentioned that about the year 1836, Mr. Philpot, his partner, performed transfusion successfully with a common pewter syringe. Mr. Whitehouse recommends that the blood should be *defibrinated*, by being beaten up with a fork, before it is injected, so as to avoid embarrassment with clots.

IX. The Actual Cautery is certainly a very efficient, and it is very far from being the most painful, manner of effecting counter-irritation. On the contrary, its effects are speedy, and not attended with very much suffering. It is easily effected by means of an iron rod with a knob of the size and shape of an olive at one end of it, and a wooden handle at the other. The knob being heated red hot, is rubbed on the skin so as to make two or three blackened lines about half an inch wide, and an inch asunder. Then the cold-water dressing or a poultice may be applied till the shallow eschars separate; and it appears to be better to keep the sores open by touching them occasionally with the cautery, than by the ordinary irritating dressings. We have spoken in more than one place of the efficacy of the cautery for closing fissures and fistulæ. The surgeon will require instruments of various sizes and shapes for these purposes.

Marshall's galvanic cautery is a very convenient instrument for cauterizing the interior of sinuses, or fungous granulations. A current from a galvanic battery of half-a-dozen cells is passed along the metallic rods and through the handle; the rods are isolated by an intermediate strip of ivory, and the current passes through the wire at the end, raising it to an intense heat. The wire can be arranged in any convenient shape. There are other modifications, some having an apparatus in the handle for making and breaking contact at will.



X. Setons are introduced by pinching up a fold of the skin, and pushing a needle through it armed with a skein of silk or cotton, or a long flat piece of india-rubber. As soon as one or two inches of the thread are brought through, the needle is cut off. A fresh portion of the thread is to be pulled through the wound every day, so as to keep up a constant irritation and discharge. If the discharge is insufficient, the thread may be covered with some irritating ointment before it is drawn under the skin.

XI. THE MOXA is a peculiar method of counter-irritation long practised in the East, and occasionally employed in Europe, for the relief of chronic nervous and rheumatic pains, or for chronic diseases of the joints. One or more small cones, formed of the fine fibres of the *Artemisia chinensis*, or of some other porous vegetable substance—such as German tinder, or linen impregnated with nitre, are placed on the skin over the affected part, and then are set on fire, and allowed in burn away so as to form a superficial eschar. The surrounding skin must be protected by a piece of wet rag, with a hole in it for the moxa.

It is convenient sometimes to use the moxa as a rubefacient or vesicant, and not as a cauterant. A roll of German tinder ignited may be held with dressing forceps at a little distance from the skin, the surgeon at the same time blowing upon it with a blowpipe till the skin becomes red.

XII. VACCINATION.—The matter should be taken on the seventh or eighth day, before an inflamed areola is spread around the vesicle; and it should be *lymph*, clear and transparent, not purulent. The operator with the point of a lancet—a sharp-pointed tenotomy knife is better—should puncture, scratch, or abrade the cuticle in five spots, on the outside of the left arm below the shoulder: each spot may be the size of O and the five may be arranged in the form of a cross. Then taking a drop of clear lymph on the point of the knife, he inserts it into one of the spots, taking care that the abraded skin absorbs it; and so with the others. The lymph should be applied directly from one child to another, and should not be carried about on points or lancets. But if the lymph for the first patient is on *points*, the surgeon should hold them in the steam of warm water so as to liquefy it, and then wipe one on each abraded spot.

XIII. ELECTRICITY AND GALVANISM.—In certain cases of defective circulation and nervous influence; when the thigh is weakened and benumbed after sciatica; in cases of atrophy of the extremities after fever; when the extensors are paralyzed from long disuse, as after disease of joints; in deficient menstruation; in loss of voice from relaxation of the mucous membrane of the fauces; in hysterical neuralgia,—these powerful agents may be resorted to with every prospect of benefit. But the cases to which they are most applicable, are those of asphyxia from poisoning or hanging, when the affusion of cold water and other stimulants fail to excite the action of respiration. The best method in these cases is, to place one wire in front of the neck and the other at the pit of the stomach; or, if the sensibility is so feeble that this fails to take effect, a needle may be inserted deeply between the eighth and ninth ribs on either side, so as to reach the diaphragm, and the current be passed between them. The most convenient apparatus seems to be a large single-cell battery on Smee's or Daniell's principle, with a coil wound around a piece of soft iron, which is thereby converted into a temporary magnet, and with a contrivance for interrupting the circuit, and giving a stream of gentle shocks.

XIV. GALVANO-PUNCTURE.—In obstinate neuralgia it is a good plan to insert two needles deeply, at two points in the course of the nerve, and to pass a galvanic current through them.

CHAPTER IV.

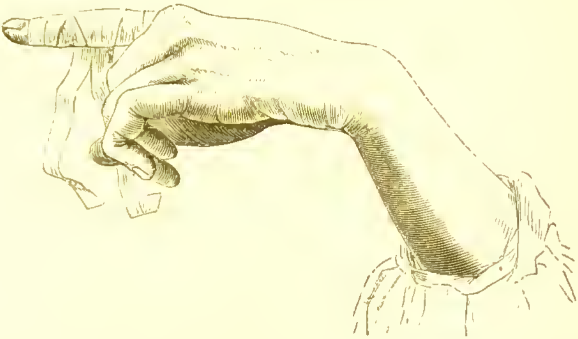
BANDAGING.

I. BANDAGES usually consist of strips of linen, calico, or flannel, varying in breadth from one to three, five, or more inches, and in length from one to six, eight, or twelve yards. Sometimes they are made of india-rubber web, or of a substance like stockings; but, for most purposes, stout unbleached calico, or thin fine calico, will answer. They are generally rolled up longitudinally for use, and hence have received the name of *rollers*. Besides the simple roller, there are many compound bandages, as the T bandage, and the many-tailed bandage (described at p. 258); but the latter are not now much in use, and, like other special bandages, are generally prepared by professed bandage-makers. Lastly, bandages may often be made out of handkerchiefs, or square pieces of linen.

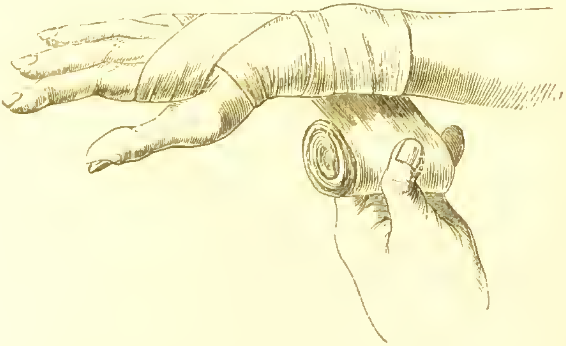
II. The chief uses of bandages are, 1st, to keep on dressings, to protect a diseased part from injury, and put some little restraint upon its motions; 2ndly, to afford a support to relaxed muscles, ligaments, and vessels. Deprive any part of its normal support, and varicose veins and dropsical effusions are sure to occur; and conversely many œdematous and other chronic swellings of the limbs and joints may often be cured by the proper application of bandages alone.

III. THE ROLLER.—In applying this to any limb, the surgeon should hold it as represented at p. 68, or in the next figure but one, and should pass it from one hand to the other as he encircles the limb with it. He should begin at the extremity of the limb, applying it most tightly there, and a very little more loosely as it ascends. He should unfold very little of it at a time, and should make each fold overlap about a third of the previous one. When the limb increases in size, he must turn the bandage on itself after the manner depicted in the cuts.

IV. BANDAGE FOR THE FINGER.—This is a simple strip of linen, that may be wound round the finger a few times with the requisite tightness. We introduce the figure in order to show how to fasten it neatly without pins or stitches, by merely splitting up the end of the bandage into two tails, which may be turned opposite ways round the finger, and be tied in a bow. This is a most convenient way of keeping dressings on the penis.

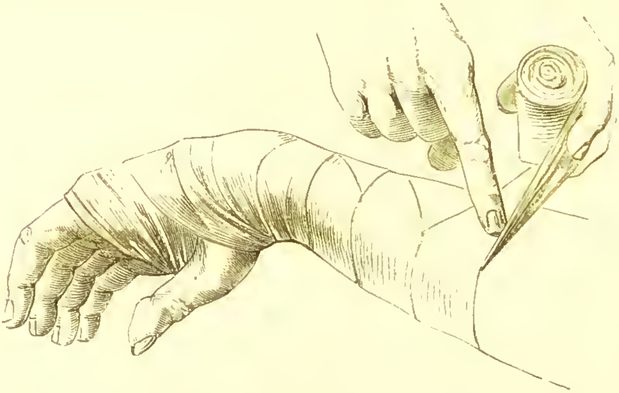


V. For the Hand.—A bandage about two inches wide may be passed in a figure of 8 round the hand and wrist, excluding the thumb, and may be finished by one or two circular turns round the wrist.

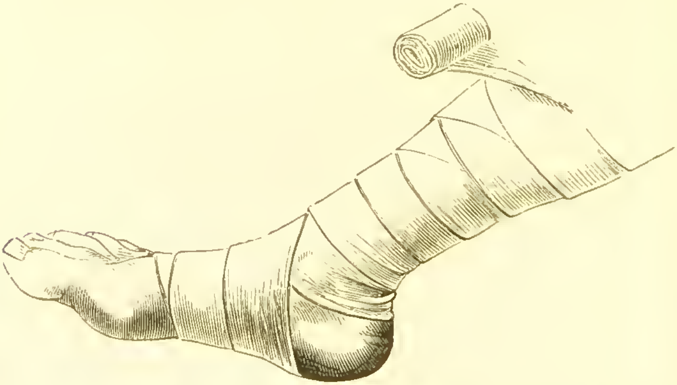


VI. For the Fore-arm.—After applying it about the hand and wrist as just described, carry it up the fore-arm, and in every turn fold the bandage sharply and smoothly back upon itself, in such a way that it may lie smoothly on the limb.

VII. For the Foot.—Let the roller be first passed round the metatarsus, and then be carried up round the ankle, and back again round the foot exactly as depicted at p. 68. The bandage should always be brought up on the inner side of the instep, as there shown, in order to support the arch of the foot.

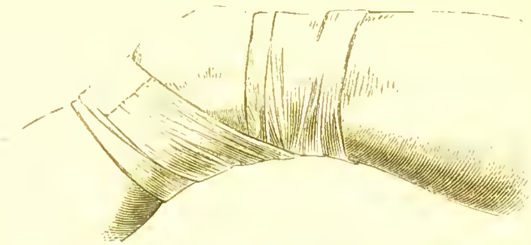


VIII. For the Leg.—After the foot and ankle have been well enveloped, let the bandage be carried up the leg, and be turned sharp on itself on the calf, in order that it may lie closely, and the folds not be separated.

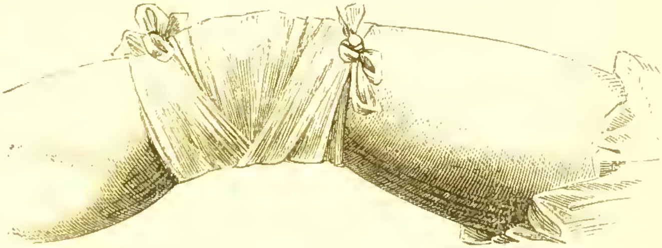


IX. For the Knee.—To support the knee, in ordinary cases, a bandage may be passed round it in a figure-of-8 form, excluding the patella. If that bone is to be covered, the bandage must be passed lightly over it afterwards several times, making turns when necessary to procure smoothness.

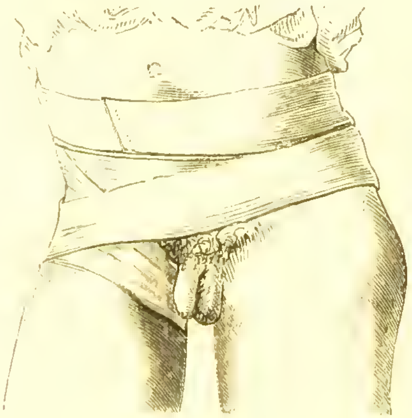
X. Four-tailed Knee Bandage.—When it is merely wished to keep on dressings, or to give slight support, the four-tailed bandage devised by Dr. Westmacott, may be used. A piece of linen a yard and a half long, and eight or nine inches wide, is split up in the middle at each end to within a few inches of the centre. The centre being then



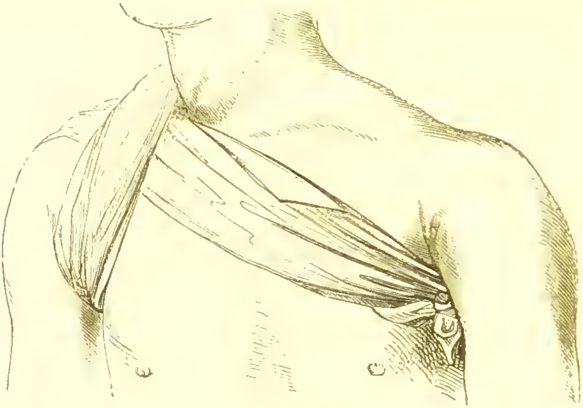
placed on the patella, the four tails are brought under the knee, crossed, and tied two and two.



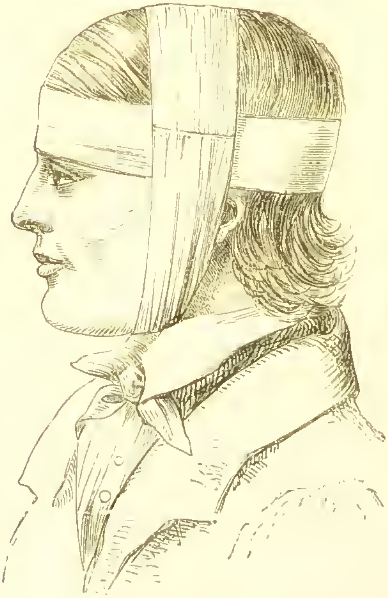
XI. For the Groin.—Having passed a roller round the lower part of the abdomen, and secured it with a stitch, bring it in front of the affected groin, then round the back of the thigh, next round the abdomen; and so on in a figure-of-8 form, with the folds crossing each other over the groin.



XII. FOR THE AXILLA.—In order to keep on dressings or poultices,



&c., put the centre of a common handkerchief folded cornerwise under the axilla, cross it over the shoulder, and carry the ends one before, the other behind, the chest, to tie under the opposite axilla.*



XIII. FOR THE HEAD.—A roller having been carried horizontally round the forehead and occiput, and secured by a stitch, let it be carried vertically over the head and under the chin. At the point of crossing on either side let it be secured by a stitch.

XIV. FOUR-TAILED HEAD BANDAGE.—A four-tailed bandage having been prepared as directed for the patella, and the centre of it having been placed on the top of the head, inclining either to the front or the back, as circumstances may require, two of the tails may be carried back round under the occiput, and be either tied there or be brought round the neck; and the other two be tied under the chin.

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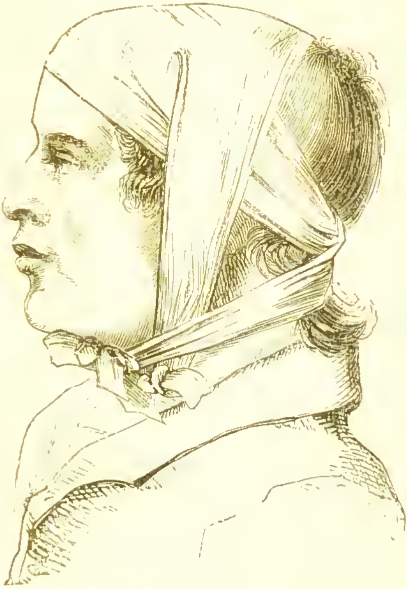
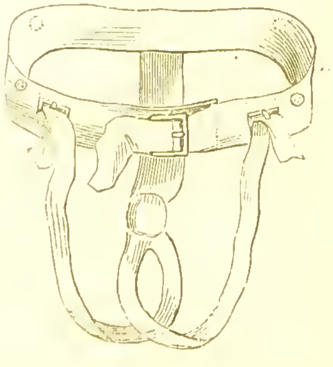
* Copied from Smith's Minor Surgery, Philadelphia, 1843.



In bandaging the head, care should always be taken to comb the hair so that it may lie smoothly and comfortably; and likewise to arrange the bandages so that the pressure may tell exactly where it is required.



XV. BANDAGE FOR THE PERINÆUM. — This consists of a circular girth buckled firmly round the pelvis; and of a piece that descends perpendicularly, and that is provided with a pad, formed of pieces of flannel, covered with oiled silk, intended to press on the perinæum. The perpendicular piece is divided to enclose the scrotum, or labia, and lastly, is brought up in two portions to be attached to the circular girth in front. The pad must be made capable of being slipped backwards or forwards on the straight strap, so that it may be made to bear with nicety on the exact spot required. The circular girth may be kept up in its proper place by means of a pair of braces passing over the shoulders. This bandage is highly useful in prolapsus ani; and in prolapsus uteri from relaxation of the vagina; in which firm pressure on the perinæum gives the greatest possible comfort.

CHAPTER V.

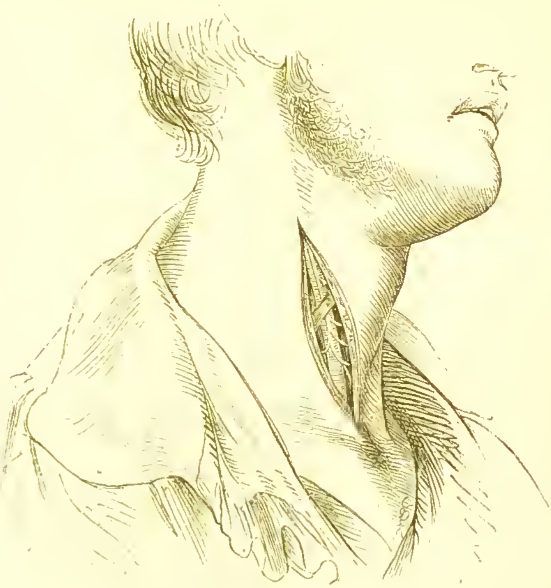
OPERATIONS FOR TYING ARTERIES.

SECTION I.—THE CAROTIDS, LINGUAL AND FACIAL.

1. THE COMMON CAROTID ARTERY of either side, follows a course as nearly as possible represented by a line drawn from the sterno-clavicular articulation to a point midway between the angle of the jaw and the mastoid process. Each artery lies against the anterior spinal muscles, the longus colli, and rectus capitis anticus major. Each is contained in a dense cellular sheath, which includes, besides the artery, the internal jugular vein on its outer side, and the pneumogastric nerve between the artery and vein. In front of the sheath, and connected to it, lies the descendens noni nerve, which sweeps downwards, and about the middle of the neck unites with a branch of the cervical plexus, to form a loop from which branches are given off to the muscles that pull down the larynx. Behind the sheath lie the sympathetic and cardiac nerves, and at the lower part the inferior thyroid artery and recurrent nerve cross behind it towards the larynx. Yet it must be recollected that occasionally the descendens noni has been found within the sheath, or behind the artery; and that the inferior thyroid artery has been found in front of the carotid. On the inner side lie the trachea and larynx, and the thyroid gland, which last somewhat overlaps the artery. On the outer side are chains of lymphatic glands.

The left artery and the right differ in their origin, and in their relations during the first part of their course. The left arises from the arch of the aorta, and rests at first on the trachea, thoracic duct, and œsophagus. Both terminate opposite the upper border of the thyroid cartilage by dividing into internal and external carotids. The left jugular vein lies rather in front of the left carotid, as it goes to empty itself into the left brachio-cephalic vein, which crosses the artery at its origin.

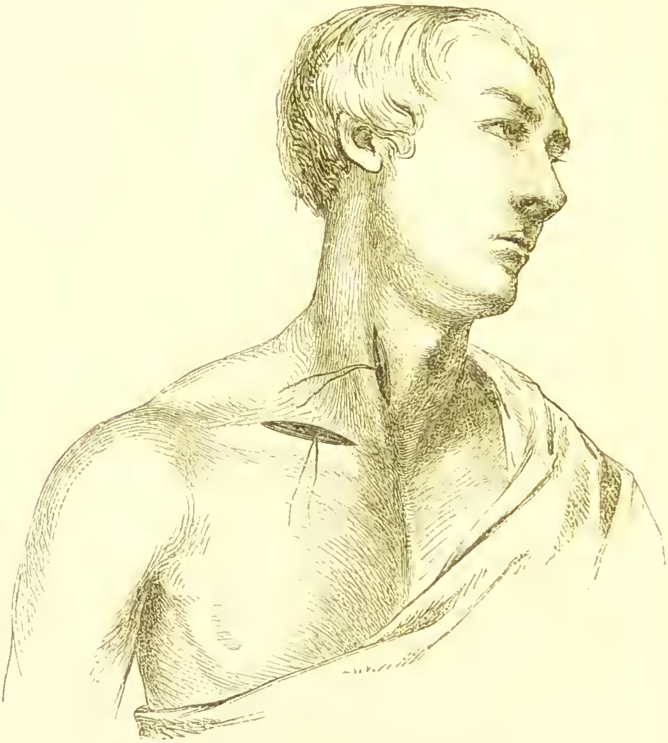
The right carotid arises from the arteria innominata, and ascends more perpendicularly. The right internal jugular vein is more external than the left, and near its termination diverges from the artery, leaving an interval of half an inch between them. This makes a material difference in tying these arteries low down.



Each artery is covered by the sterno-mastoid, sterno-hyoid, and sterno-thyroid muscles, and is crossed by the omo-hyoid, almost two inches above the clavicle. A dense fascia is connected with this muscle. In the upper part of its course, corresponding to the larynx, the sterno-mastoid leaves the carotid, which is then covered only with skin, platysma, and fascia. Both common carotids terminate opposite the upper border of the thyroid cartilage, by dividing into internal and external carotids.

The carotid artery, in the lower part of its course, may require to be tied for aneurysm in the upper part of the trunk. In the upper part, the operation may be necessary for hæmorrhage or for erectile or other tumours about the face or orbit; moreover, it may be expedient, on Brasdor's principle, in aneurysm too low down to admit of a ligature between the disease and the heart.

To tie the Carotid in its lower part.—The patient being placed on his back, with the shoulders raised, and with the head thrown back and slightly turned towards the opposite side, an incision three inches in length is made on the inner margin of the sterno-mastoid muscle. This incision should be carried through skin, platysma, and superficial fascia, and should extend from opposite the cricoid cartilage, to a quarter of an inch above the sternum. The head should now be turned to the side operated on, and be brought a little forwards, so as to relax the sterno-mastoid muscle, the edge of which is to be exposed,



and a vein that usually runs in this direction to be looked for and avoided. With slight use of the finger or handle of the scalpel, the sterno-mastoid must be separated and drawn outwards, and the sterno-hyoid and thyroid muscles inwards. If it will at all make matters more easy, the lower and inner portion of the sterno-mastoid may be divided, and the same may be said of the omo-hyoid, which should now be sought for near the upper part of the incision. The dense fascia which unites this muscle to the sheath must now be scratched through, and the sheath will be seen, with the descendens noni upon it, which should be drawn to the inner side. The greatest care should be taken throughout, and more particularly now, to avoid the numerous thyroid and other veins to be met with. The sheath must be pinched up with forceps, and opened with a cautious touch of the knife, whose flat surface should be held towards the artery. The aperture is to be enlarged on a director, and an aneurysm needle,—a curved blunt needle with the eye near the point,—armed with a ligature, to be passed round the vessel from without to within, the point of the needle being kept close to the vessel in order to avoid the vagus nerve. When its point appears on the inner side, the surgeon seizes the ligature with forceps, and withdraws the needle; ascertains that the nervus vagus is not included in the ligature, and then ties tightly a double knot as represented at page 129. One end of the ligature may then be cut off close to the knot, and the other be left hanging out of the wound, which is to be closed with plaster when bleeding has ceased. The patient must be kept at perfect rest in bed till the ligature separates.

As a rule, on the right side the ligature should be applied as high as possible: on this side too there may be no trouble with the internal jugular. On the left side, this vein will, in all probability, get in the way and require to be drawn outwards. On this side too the relation of the œsophagus internally, and of the thoracic duct posteriorly and externally must be remembered, as these parts must be avoided carefully.

To tie the Common Carotid in its upper part.—The patient is placed in the same position as before, but with the head more thrown back. An incision of three inches is made through skin and platysma, on the anterior edge of the sterno-mastoid muscle, from a little below the corner of the lower jaw to opposite the cricoid cartilage. The deep fascia, here very dense, is to be pinched up, opened, and further divided on a director most carefully, in consequence of its intimate connection with the sheath of the artery and with the veins. The edges of the wound are now to be drawn asunder, the pulsation of the artery sought for, and the sheath opened over it, in the manner and with the precautions before described; a small portion of the vessel must be exposed, and the ligature be passed as before directed. The jugular vein will be more difficult to avoid here than in the lower part of the neck.

II. THE EXTERNAL CAROTID may, if wounded, require a ligature; or if any of its branches are wounded, *and cannot be tied;* but such an operation is very rarely, if ever, practised, ligature of the common carotid being preferable. An incision of the same length and direction as in the two preceding operations should be made through the skin, platysma, and sheath, so as to tie the vessel near its origin, below the part where it is crossed by the digastric muscle and ninth nerve.

To tie the external carotid above the digastric muscle, before it has gained the parotid gland, the head should be well extended, and an incision made from the lobe of the ear to the great cornu of the os-hyoides, successively through the skin, platysma, and superficial fascia. The student must not expect to meet with the deeper parts in this situation disposed, as they appear in the dissecting-room, after they have been dissected, when in fact they are completely displaced and pulled down. The parotid gland first comes into view, by raising the border of which, the anterior edge of the sterno-mastoid is exposed, and also the posterior bellies of the digastric and stylo-hyoid muscles. Along the upper edges of the latter the vessel may be found entering the parotid. Considerable venous hæmorrhage will be encountered in this operation, which is very difficult to execute well, even on the dead body.

III. The Internal Carotid is sometimes wounded by gashes, stabs, or shot from without, or by punctures from within, as may happen when a person falls down with a tobacco-pipe in his mouth, and drives it through the back of the pharynx. In such cases, ligature of the common carotid is a very uncertain remedy, and Mr. Guthrie proposes (in compliance with the rule of always securing a wounded artery by two ligatures, one above and one below the wounded part) to reach the wounded vessel by operation. The leading feature of this operation is, the removal of the second molar tooth, and division of the lower jaw-bone, so that the angle of that bone may be everted, and room be given for reaching the vessel. Mr. Mayo once tied this artery, and in order to reach it cut through the styloid process of the temporal bone.*

IV. The Lingual Artery may be tied by making a transverse incision along the os hyoides, from a little below the symphysis of the jaw to near the border of the sterno-mastoid muscle. The skin, platysma, and fascia being divided, the artery must be looked for where it lies upon the greater cornu of the os hyoides, below the digastric muscle and ninth nerve. This artery has been tied in cases of tumours and wounds of the tongue; but, considering the depth at which it lies from the surface, the irregularity of its origin, and the important parts in its vicinity, it is much better, as a general rule, to tie the external or common carotid.

V. The Facial Artery may easily be tied by cutting through the skin and areolar tissue that cover it where it turns over the jaw, at the anterior border of the masseter; but such an operation can hardly ever be requisite.

SECTION II.—THE INNOMINATA, SUBCLAVIANS, AND ARTERIES OF THE ARM.

I. The Arteria Innominata has been tried in cases of aneurysm of the right subclavian, extending inwards as far as the scalenus. The patient being placed on his back, with the shoulders raised and the head thrown back, one incision, two inches in length, is to be made along the inner margin of the sterno-mastoid muscle, terminating at the clavicle, and another across the origin of that muscle, meeting the former at a right angle. The flap of integument thus formed is to be turned up, and the sternal and part of the clavicular origin of the sterno-mastoid are to be divided on a director, which is to be passed behind the muscle, and kept as close to it as possible. The areolar tissue and fat which now appear, being turned aside, the sterno-hyoid, and sterno-thyroid muscles must be separately divided on a director. A strong fascia, which next appears, must be cautiously scratched through, and the carotid be traced with the finger, down to its origin. Then the vena innominata being depressed, a ligature may be carried from without inwards, round the artery, close to its bifurcation, taking care to avoid the vagus, recurrent, and cardiac nerves.

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* For further particulars of Mr. Guthrie's operation see Lancet, 1850, vol. ii., p. 143.

Mr. Guthrie says, that "if the operation be often repeated, it may eventually be successful." Whether the repetition is desirable, is however doubtful.[*]

In *Aneurysm of the Innominata* it is impossible, or if possible fatal, to place a ligature between the tumour and the heart; and the ligature of the carotid or subclavian, or both, was the only resource, till Mr. Edwards, of Edinburgh, showed the way of giving relief by pressure. An unhealthy woman of 50 had a tumour the size of an apple situated between the sterno-mastoid muscle and the middle of the neck, pulsating violently, soft and compressible, feeling like a vulcanized india-rubber ball, which, though compressible, expands the moment pressure is withdrawn. Another pulsating tumour rose in front of the trachea: they were the evidently distinct bulgings of one aneurysm, as pressure on one increased the size of the other. These tumours were of two months' growth, increasing rapidly, and attended with great dyspnœa.

Brasdor's operation was contemplated, but abandoned because aneurysm of the aorta was suspected. Then Mr. Edwards determined to apply pressure to the carotid and subclavian arteries. This was accomplished by two conical pads of cork; one attached to an arc of steel in which the neck rested, and which was supported by an upright rod, attached to a very firm broad girth round the chest; the other to a band over the shoulder. The instrument was so adjusted as to stop all pulsation in the branches of the external carotid, and of the wrist of the affected side. Every morning for the first two weeks Mr. Edwards roughly manipulated the sac for the purpose of breaking up the fibrine. For the first two days, the tumour seemed to become thinner, and the pulsation more violent; after that it became more solid; and in three months the aneurysm of the innominata was virtually cured, whilst that in the aorta had made little progress.[†]

Dr. William Wright, of Montreal, has published an interesting account of a case in which he prolonged a patient's life for a month, by ligature of the right carotid, when death was imminent from a bursting aneurysm of the innominata;—and shows that his operation is superior to the ligature of the subclavian in the third part of its course, inasmuch as half the current of blood though the aneurysm is obstructed; whereas by tying the subclavian only one-sixth is obstructed, because its chief branches are given off on the near side of the ligature.

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[*] This operation was first performed by Mott, at the New York Hospital, in 1818. The patient walked out on the 20th day, bleeding from the wound occurred on the 21st, and he died on the 26th. The arch of the aorta was extensively diseased. Dr. Gräefe performed it in 1822 at Berlin; the patient died of hæmorrhage on the 67th day. See Cooper's Surgical Dictionary, Art. Aneurysm; South's Chelius, vol. ii., contains details of half a dozen other cases.

[†] Case of Mrs. Denmark, by Wardrop, (ligature of subclavian,) quoted in Cooper's Surg. Dict.; case by Mr. Evans, of Belper, in which the carotid was tied, ibid.; case in which Mr. William Wickham, of Winchester, tied the carotid and then the subclavian, Med. Chir. Trans., vol. xxiii.

II. The Right Subclavian Artery, in the first part of its course, that is to say, between its origin from the innominata and the scalenus muscle, has been tied for aneurysm in the second and third parts of its course, by an operation almost precisely similar to the foregoing; but it is the most difficult operation in surgery, and the most unsuccessful.

III. The Subclavian Artery, in the third part of its course, is about an inch and a quarter long, and passes from the scaleni muscles downwards and outwards under the clavicle to the lower border of the first rib, where it takes the name of axillary. Its depth will depend on the greater or less curve of the clavicle, the length of the neck, and the position of the shoulder, whether high or sloping. It lies on the scalenus medius and the upper surface of the rib. In front are the skin, platysma, supraclavicular nerves and vessels, cervical fascia, and areolar tissue of varied density. The clavicle and the subclavius muscle are also before it. The subclavian vein is on a plane anterior, but inferior, and is nearly concealed by the clavicle. It is here joined by the external jugular, by the posterior scapular, and by other small veins from the shoulder and the side of the neck, which sometimes form a large and intricate plexus. The brachial nerves are above and behind.

Some of the irregularities in the subclavian artery are of practical interest. The artery may perforate the anterior scalenus, or lie in front of it, close to the subclavian vein. The vein has been met with accompanying the artery in its usual course between the scaleni. On the right side the artery may come from the back part of the innominata.

Both subclavians may rise higher in the neck, an inch or more above the usual position, which is just a little above the clavicle; and the right is the more subject to this variation.

The vessel may readily be felt in the lower division of the posterior triangular space of the neck, immediately behind the clavicle; and here it may be compressed by the fingers.

The patient should be laid on a table, with the shoulder of the affected side drawn down as far as possible, and the head turned to the other side. An incision must then be made above and parallel with the clavicle, three or four inches in length. It should cut through the skin and platysma, and should extend from over the outer edge of the sterno-mastoid to the trapezius. The preliminary incision may be conveniently made by drawing down the skin, and cutting through it while it is steadied on the clavicle.

The external jugular vein will probably now be seen, and should be drawn with a blunt hook, to whichever side is the more convenient, and if need be, tied with a double ligature, and cut. The clavicular portion of the mastoid muscle, if unusually broad, should be severed. Perhaps it will be best to do so in all cases. The knife must now be used very sparingly to divide the fascia, and if it can be dispensed with altogether, so much the better, and the dissection continued by tearing, scratching, and picking with directors and probes, some of which should have points like knitting-needles. The omo-hyoid muscle must be sought and drawn up. Here, in a space bounded externally by this muscle, anteriorly by the sterno-mastoid, and below by the clavicle, are the artery and the brachial plexus of nerves. The omo-hyoid varies in its position; sometimes it runs close to and parallel with the clavicle, and then without great caution the dissection might be made above the muscle. It may have a partial attachment to the clavicle, or get its entire origin from this bone; or may be very high, or altogether absent. The supra-scapular, and even the transversalis colli arteries may be met with, and must be drawn aside.

The great landmark, the anterior scalenus muscle, must be searched for with the forefinger, and be traced to its insertion in the rib. The precise position of the artery will then be ascertained, and the fascia and areolar tissue that cover it should be carefully torn through. It is now that the use of dividing a portion of the sterno-mastoid is apparent. Some of the lower branches of the brachial plexus of nerves always appear first, and are very likely to be taken up instead of the vessel; but the peculiar aspect of the artery should be well looked for in order to avoid this mistake. Indeed the appearance of the artery alone should be trusted to; for sometimes when its coats are thickened, pulsation cannot be detected.

Venous hæmorrhage is often most troublesome, and when pressure on the smaller veins does not readily stop it they must be tied. If the subclavian vein is wounded, pressure alone can be employed. The act of passing the needle under the artery has been attended with almost incredible difficulties, and so has the tying of the ligature, and many ingenious instruments have been devised to render both of these proceedings more easy.

IV. THE AXILLARY ARTERY is that portion of the main trunk of the arm, which extends from the lower border of the first rib, to the lower edge of the tendons of the latissimus dorsi and teres major in the axilla. Its entire course is that of a gentle curve, with the convexity outwards and upwards. For surgical purposes it may be divided into two portions, the inaccessible, and the accessible; the former being the upper part of its course, where it lies thickly covered by muscle, and the latter being the lower part, where it can be felt against the humerus in the axilla.

In the upper part of its course the artery lies upon the first intercostal space, and on the second digitation of the serratus magnus; its vein lies internal, the brachial plexus is above and behind it; afterwards it encircles the artery. It is in the case of wounds only that an operation is likely to be attempted in this situation: in the case of aneurysm, the subclavian must be tied above the clavicle.

In the case of wound, the dissection must be carried down to the bleeding spot, through any muscle that may be in the way, and according to the circumstances of the case. But the following operation may be practised in the dissecting-room.

To tie the Axillary Artery in the upper part of its course.—The shoulder should be thrown back, and the arm drawn back, so as to put the pectoral muscle on the stretch. An assistant should be at hand to compress the subclavian artery if necessary. An incision should be made from the sternum half an inch below the clavicle, to the edge of the deltoid muscle; recollecting that the cephalic vein and thoracico-acromialis artery, which run in the interval between the pectoral and deltoid muscles, should not be injured. The pectoralis major should then be divided to the same extent. Now there may be a pause to check hæmorrhage, which being accomplished, and the lower border of the wound being well drawn downwards, the areolar tissue is to be carefully cut through, and then the edge of the pectoralis minor will come into view, going upwards and outwards over the vessels and nerves to be inserted into the coracoid process. Any branches of the thoracic arteries that may be wounded should at once be tied. The next point is, to scratch through the *costo-coracoid*, or *coraco-clavicular* fascia: a dense fascia extending from the first rib to the coracoid process, and from the upper edge of the pectoralis minor muscle, to the subclavius. At this stage of the proceedings, the arm should be brought to the side, to relax the pectoralis major. And now some touches with a blunt director will probably expose the axillary vein, which should be pressed inwards and there kept with a blunt hook. The beating of the artery must now be sought for, the vessel be isolated, and an aneurysm needle be passed from below upwards, with all care not to include any of the nerves, either along with the artery, or instead of it.

It would be possible to tie the artery below the point where it is crossed by the pectoralis minor, by extending the incision downwards.

To tie the Axillary Artery in the axilla.—The patient being placed on his back, the arm must be as widely as possible separated from the trunk, and the fore-arm supinated, and the whole limb rotated in the same direction. The surgeon will then make out the anterior and posterior boundaries of the axilla; the anterior constituted by the pectoralis major, the posterior by the latissimus dorsi and teres major, which go to their respective insertions at the edges of the bicipital groove. Between these muscles the axillary vessels and nerves lie, and can be felt against the upper extremity of the humerus; with the upper part of the coraco-brachialis between the vessels and the pectoralis major. The surgeon will recollect the relation of the nerves of the axillary plexus to the artery at this point. The external cutaneous nerve (which perforates the coraco-brachialis muscle) with the outer root of the median lie to the outer side; the inner root of the median, the ulnar and internal cutaneous, on the inner side, and the circumflex and musculo-spiral behind. (See p. 696.)

The operator makes an incision two or two and a half inches long, over and parallel with the upper extremity of the humerus, between the pectoralis major and latissimus dorsi, but rather nearer the latter. It should cut through the skin. Then a cautious dissection through fascia will reveal the axillary vein and median nerve,* the former of which should be drawn inwards, and the latter outwards, whilst the artery is cleared by careful scratches with probes of various degrees of bluntness, else the thoracic and subscapular veins may be wounded. The aneurysm needle is passed between the vein and artery.

There are frequent *irregularities* in the relation of this artery to the nerves and veins, the knowledge of which should make the surgeon careful. Instead of one vein, there may be two or three. There may also be irregularities in the course and distribution of the branches of the artery.

V. THE BRACHIAL ARTERY runs obliquely down the inner side of the humerus, to the middle of the bend of the elbow; it runs along the inner border of the coraco-brachialis and biceps respectively, which muscles successively overlap it a little, and form the best guides to it. Its pulsations may be felt along the whole of its course, and it is covered only by skin and fascia, though the operator may not find it so superficial as he may imagine it to be. It is accompanied by two venæ comites, whose numerous branches encircle it; and by the median nerve, which first lies on its outer side, between it and the coraco-brachialis, then crosses over it, so as to be quite internal to it at the elbow, where both become covered by the semilunar fascia of the biceps.

There are several irregularities not very unusual, which the surgeon should be prepared for. The median nerve may run parallel with the artery, over it, under it, or on the outer side. The internal cutaneous nerve, instead of being superficial, may be deep; and the basilic vein which lies beneath the skin, over and parallel with the artery, in its lower third, may ascend superficially up the arm. The radial artery may arise from the upper third of the brachial, or even from the axillary. The ulnar may also have a high origin, and run either superficially or deeply to the wrist. The same may happen to the interosseous artery. There may be a double brachial; and the superior profunda may have a common origin with the posterior circumflex, and form a branch large enough to be mistaken for the brachial.

To tie the brachial in its upper third.—The limb is to be drawn from the side and supinated. The surgeon makes out the coraco-brachialis muscle, endeavours to ascertain the course of the basilic vein, and to feel the pulsation of the artery. Then he makes, carefully, an incision three inches in length over the artery, recollecting that the skin is here very thin, and taking care not to cut the internal cutaneous nerve. The fascia should next be divided to the same extent; and under it probably the basilic vein will be found, to the inner side of the artery. Now the fore-arm may be bent to relax the parts, and the coraco-brachialis be drawn outwards. Any veins or nerves in the way may be drawn aside with a blunt hook; the sheath of the artery be opened, and the median nerve which comes into sight be drawn outwards. Now the operator must carefully identify the artery by its pulsation, or by the appearance of its coats; but it may not pulsate unless the muscles of the limb are relaxed. The needle must be passed in whatever direction the operator finds most convenient for avoiding the veins.

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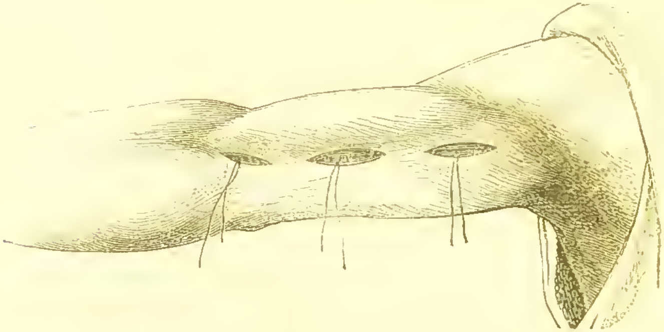
* In case of difficulty, find the inner border of the coraco-brachialis, between which and the artery lies the median nerve. Malgaigne, Operative Surgery, by Brittan, p. 130.

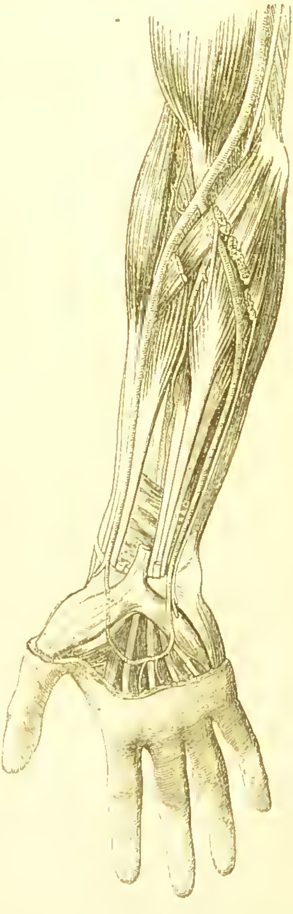


Should a large branch be exposed, the trunk must be tied above and not below it. Should two large arteries be found running parallel, it must be ascertained by pressure which of them communicates with the aneurysmal sac, or the wound, and that one tied; but if no effect be produced, except both be compressed, then both must be secured. Should it happen when only one vessel is apparent, that compression on it does not check bleeding or pulsation below, search must be made for a second one. When the ligature is applied very high, the proximity of the origin of the superior profunda artery must not be forgotten.

To tie the Brachial Artery in the middle of the arm, the incision should be along the inner side of the biceps. The basilic vein will probably be found passing from its superficial to its deeper course. The median nerve will, if regular, be seen lying over the vessel, and should be drawn either outwards or inwards, and the biceps be well relaxed. The operator should be on his guard not to mistake the inferior profunda artery and the ulnar nerve, for the brachial and the median nerve, an error liable to be made if the profunda has become enlarged, and best avoided by dissecting towards the biceps, or rather towards the centre of the limb, and not getting too far internally. The middle third of the artery should be tied, when such an operation is required for hæmorrhage from the hand, or from the interosseous vessels.

To tie the Brachial Artery in its lower third.—This operation has been most frequently done for aneurysm, produced by careless venesection, and there can be no doubt that in the large majority of small *circumscribed* aneurysms, it will be sufficient to tie the artery just above the tumour, and as near it as possible.

In the case of traumatic aneurysm, the difficulties of the surgeon will be increased by the infiltrated and swollen state of surrounding parts, and possibly the tumour may be the only guide to the vessel. An incision from two and a half inches long to three inches, should be made obliquely about half an inch internal to the tendon of the biceps, the position of which should of course be first ascertained. The basilic vein must be held aside if in the way, as well as any twigs of nerves. The fascial expansion of the biceps must not be needlessly cut, as contraction of the arm might ensue, or the healing of the wound become tedious.

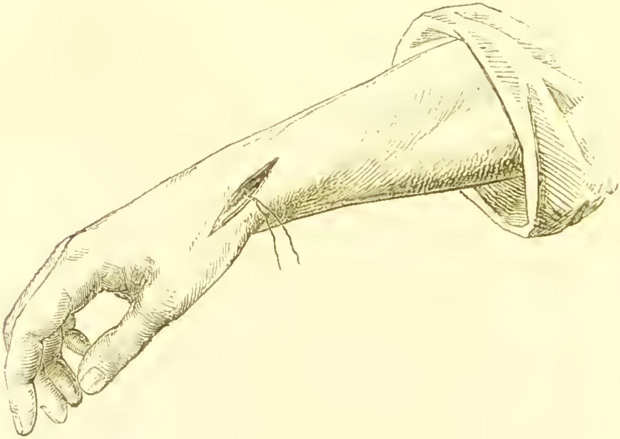


Should it be considered necessary to tie the brachial very low down in consequence of the radial having been wounded, the vessel lies in a triangular space, bounded by the pronator radii teres internally, and by the supinator longus externally, having the median nerve, when regularly placed, on the inner side. Very great care should be taken to conduct the operation with delicacy and despatch.

It may be observed that when the artery is wounded in venesection, the surgeon has the choice of three measures:—1st. To enlarge the wound upwards and downwards, and tie the vessel above and below the injured part. 2ndly. To attempt cure by pressure; placing a graduated compress on the wound: bandaging the whole limb: compressing the artery above, and so endeavouring to get the wound in the vessel closed, without traumatic aneurysm resulting. Should this aneurysm result, and be *diffused*, that is, without a sac, the wounded part must be secured. Should the traumatic aneurysm have a sac, either this tumour may be cut into and both ends of the vessel tied; or recourse may be had to, 3rdly, ligature of the lower part of the brachial.

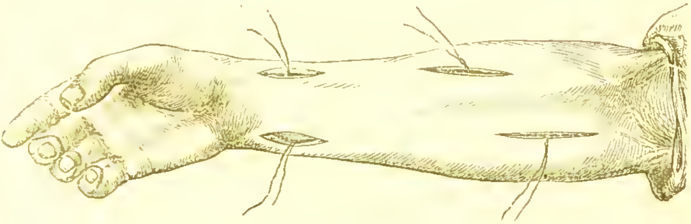
VI. THE RADIAL ARTERY pursues a course corresponding with a line drawn from the middle of the bend of the elbow to the base of the metacarpal bone of the thumb. It winds over the external lateral ligament of the wrist joint, and between the first and second metacarpal bones sinks into the palm of the hand to complete the deep palmar arch. Although in the upper part of its course it lies deeply and is overlapped by muscle, it is not crossed by any. In the upper third of its course it lies deeply between the pronator teres and supinator longus, and is overlapped by both. In the lower two-thirds it lies between the supinator longus and flexor carpi radialis. It is accompanied and embraced by venæ comites and their ramifications, and in the lower two-thirds by the radial nerve, which lies on the outer side. It sometimes happens, as an irregularity, that the artery runs superficial to the supinator longus, or even to the fascia; and at the wrist may pass outside the extensor tendons.

To tie it, the fore-arm must first of all be properly fixed by assistants on a table. Then an incision three inches in length must be made over its course. The superficial fascia should be divided; the deep fascia must be slit up; and if the vessel is tied in the upper third, care must be taken to cut *between* the muscles without wounding them.



To tie the Radial Artery on the outer side of the Wrist, an incision should be made through the skin, from opposite the styloid process of the radius, to the commencement of the first interosseous space. The tendon of the extensor secundi internodii pollicis, which crosses the artery just before it dips into the palm, is the best guide to it; and it will be easier to tie the vessel on the ulnar side of the tendon.

VII. THE ULNAR ARTERY, larger than the radial, passes from the middle of the bend of the elbow obliquely inwards forming a slight curve with the concavity outwards, and then nearly vertically along the ulnar side of the fore-arm to the wrist; where it passes over the annular ligament on the radial side of the pisiform bone and enters the palm. In the upper half of the arm it is covered by the four superficial muscles which arise from the internal condyle. In the lower half it is nearly superficial, and lies between the flexor digitorum sublimis, and the flexor carpi ulnaris, the latter of which is on the ulnar side. Except in very thin persons, the tendon of the flexor carpi ulnaris overlaps the artery, within two or three inches of the wrist, and so does the inner tendon with more or less of the muscular fibres of the flexor digitorum sublimis; so that, in fact, the vessel is not quite superficial.



Like the radial it is accompanied by two veins. The median nerve is connected to it above for about an inch, is then separated by the ulnar origin of the pronator radii teres, and descends along the middle of the limb. The ulnar nerve becomes attached to the artery at about the lower part of the upper third of the fore-arm, lying to the ulnar side. On the annular ligament, it lies next to the pisiform bone, and rather posterior to the artery. When there is a high division of the ulnar, the vessel almost always passes superficial to the muscles, generally under the fascia, sometimes above it.

To tie the Ulnar Artery in the upper third of its course, a longitudinal incision, as shown in the woodcut, a quarter of the width of the arm from the inner edge, which will of course cross the artery, will be preferable to one more in the direction of the vessel; as the edges of the wound can be better separated, and what is of more consequence, the natural division that exists between the flexor carpi ulnaris and the next muscle, can be easily found. Should it be requisite to cut between the muscular mass more externally, the division should be made very low, and, if possible, between the tendons of the muscles, and carried upwards. The ulnar nerve should be looked for, as when seen it may serve as a guide to the artery.

To tie the Ulnar Artery just above the wrist, requires rather more care than to tie the radial. An incision, two inches long, should be made, and it should be about three-quarters of an inch from the inner edge of the limb. The operator should endeavour to feel the tendon of the flexor carpi ulnaris muscle, and when he can to cut just external to it. If he cuts too internally, the muscular fibres of the lower part of this muscle will bulge, and perhaps perplex him. After the skin and fascia have been divided, the artery must be sought for, covered by the tendon of the flexor carpi ulnaris, which is internal, and the inner tendon of the flexor digitorum sublimis, and the fibres of that muscle, which is external. The venæ comites are to be separated. As the ulnar nerve lies to the inner side of the artery, the needle had better be passed from within to without.

VIII. THE SUPERFICIALIS VOLÆ, the artery which continues in the course of the radial, and goes to join the superficial palmar arch, is usually small, but yet a frequent source of troublesome hæmorrhage when the ball of the thumb is wounded. But it may be a very large artery and bleed profusely, and then must be tied at the seat of injury.

Hæmorrhage in the palm of the hand should, when practicable, be stopped by tying both ends of the bleeding vessel; yet it is seldom that this can be done, on account of the manner in which the vessels retract, and of the density of the surrounding parts. The propriety of enlarging the wound, with the object of effecting this, must depend on the circumstances of the case, and can rarely be admissible about the centre of the palm. Yet if the blood spirts out with a jet, the exploration may be justifiable, as it would thus be shewn that the bleeding orifice was near. Otherwise pressure should be tried first on the wound, and next, on the radial and ulnar arteries at the wrist, and on the brachial; and if all these fail the brachial should be secured.

SECTION III.—THE AORTA, ILIACS, AND THEIR BRANCHES.

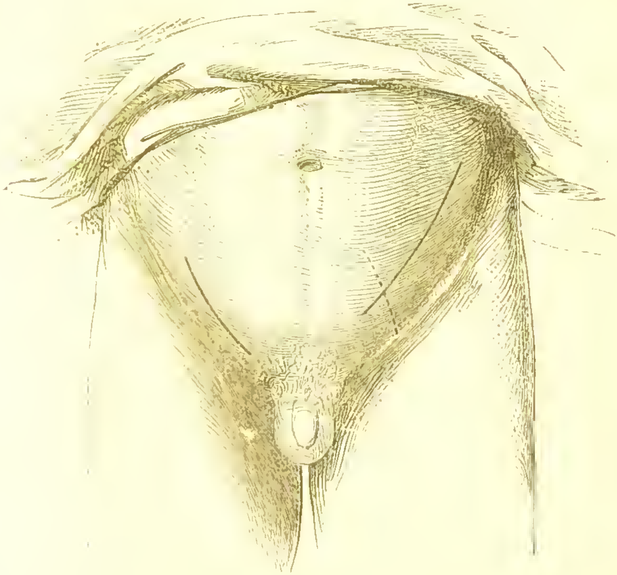
I. THE EXTERNAL ILIAC ARTERY, is not unfrequently tied for aneurysm, or wounds high up in the femoral. The process for tying it, as well as the internal or common iliac, is to cut through the abdominal muscles and fascia transversalis, and to get behind the peritonæum without wounding it, so as to reach the point desired. Before any of these operations, the bowels should be well cleared. (See p. 306.)

The bifurcation of the aorta corresponds as nearly as possible with a spot a finger's breadth below and to the left of the navel. From this point, a line drawn to the middle of Poupart's ligament, will coincide with the course of the iliac; the upper third to the common, the lower two-thirds to the external iliac.

The *common iliac* extends from the bifurcation of the aorta, on or about the body of the fourth lumbar vertebra, to the sacro-iliac synchondrosis. Its length may vary extremely in different subjects: it is usually two inches; but if the aorta bifurcates higher up than usual, or if the common iliac bifurcates lower than usual, its length may be increased to 3·5 inches. Under the opposite conditions, it may be only

·75 inch. Each common iliac is covered by peritonæum, and crossed near its bifurcation by the ureter; each, too, is in close relation with its vein; but in this respect there is a difference, for both left and right common iliac veins pass behind the right iliac artery to reach the cava, and the artery is closely connected to them both. Whereas the left common iliac artery has a slight space between it and its vein, which lies more internal to it. The rectum and superior hæmorrhoidal artery also cross the left common iliac artery.

The *external iliac artery* runs in the course we have described, along the inner border of the psoas muscle (see p. 535), having its vein on the inner side. The genito-crural nerve, which pierces the psoas, lies on it for a short distance, and there is a chain of lymphatic glands surrounding both artery and vein, which, if enlarged, may give great trouble.



To tie the External Iliac, the patient should lie flat on a table, in order that the abdominal muscles may be rendered rather tense. An incision, three and a half or four inches long, should be made above and parallel to Poupart's ligament, beginning about half an inch outside the external abdominal ring. It should be carried through skin and the superficial fascia, and be completed so as to lay bare the external oblique tendon. If the external epigastric artery be divided, as is probable, it should be secured. The tendon of the external oblique should next be cut through to the same extent, either on a director, or not. The internal oblique and transversalis muscles are now to be similarly divided; and as they vary in thickness, and as the peritonæum is close behind, this part of the operation must be conducted with great delicacy. A portion of the muscle should be lifted with forceps, and be carefully cut through, to form an opening into which the finger, or a large blunt director may be insinuated, and upon which the muscle may be divided. The edges of the wound should now be gently drawn asunder by bent spatulæ; the fascia transversalis be exposed and scratched through, and the opening be enlarged by tearing with the fingers. And next the peritonæum should be most delicately stripped off, from the walls of the abdomen and from the iliac fossa, till the finger reaches the artery, as it gradually rises from the pelvis. The sheath must be scratched through with the finger-nail or a director at the point selected, and the artery separated from the vein; the aneurysm-needle should be passed between them, and the genito-crural nerve be excluded from the knot. The wound should be brought together by sutures, the trunk be bent forwards to relax the muscles, and pressure be applied by means of a bandage and pads of cotton wool.

Sir Astley Cooper, of whose method of operating the above is a modification, separated the internal oblique and transversalis muscles from Poupart's ligament, instead of cutting through them rather higher up, as described above. The advantages of the latter plan are, that the epigastric and circumflexa ilii arteries, and the circumflexa ilii vein which crosses the artery low down, are not interfered with, neither is the spermatic cord, nor the abdominal ring. Moreover, if it should seem expedient to tie the vessel higher up, it might be done without much difficulty, by drawing up the upper edge of the wound. The circumflexa ilii and epigastric arteries are of importance for the collateral circulation. But, on the other hand, it must be confessed that the peritonæum is rather more interfered with.

In the method of operating recommended by Abernethy, the incision is made in the course of the artery, instead of across it, as in Sir A. Cooper's method. It extends upwards and inwards about three inches, from an inch above the centre of Poupart's ligature, towards the umbilicus; being longer in proportion to the stoutness of the patient. The subsequent steps are those of Sir A. Cooper's plan. This operation is convenient for cases in which it is doubtful beforehand whether the external or the common iliac should be tied. Its disadvantages are, that the peritonæum is very much disturbed, and that there is greater liability to hernia afterwards.*

II. THE COMMON ILIAC ARTERY.—In order to tie this artery, an operation has been proposed similar to that of Cooper for the external iliac; but it would be very difficult in a thin patient, and almost impossible in a fat one. It is better to make the formidable curved incision shown in the cut (p. 701).

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* This artery was tied by Mr. Partridge, in the King's College Hospital, in November 1846, for aneurysm of the common femoral, in a patient only 23 years old. It was tied by Mr. Thomas Nunn, in January 1849, for aneurysm of the common femoral, and by Mr. H. Smith, in August 1850, for aneurysm of the superficial femoral high up. The ligature came away on the twenty-eighth day. All three patients did well. Mr. Smith has at different times tied the external iliac on one side, and the superficial femoral on the other, in the same patient.

An incision is made from six to eight inches in length, the lower third being about an inch and a half or two inches above Poupart's ligament, and parallel with it. The muscles must be divided, and the transversalis fascia torn through, according to the rules given for exposing the external iliac artery. In fact, there is no practical surgical difference between them, except that the operation under consideration is more difficult, and requires more care and more assistants. The intestines are sure to bulge more or less into the wound directly that the fascia transversalis is divided, and here is the chief difficulty to be encountered. With the greatest gentleness they must be drawn upwards, while the operator separates the peritonæum from the iliac fossa. There need be no apprehension about the fate of the ureter, as it is always raised along with the peritonæum, the two being closely united. Having gained the soft brim of the pelvis, the operator may seek the external iliac, and if not very much diseased, it will be readily found, and form a good guide to the common trunk. The sheath of the vessel must be opened just above the bifurcation, and the needle be passed, if possible, from within to without.[*]

Another, or *posterior* operation, was proposed by Sir P. Crampton.[†] It has not yet been successful, but is certainly not without apparent merits. By it the peritonæum is very much less disturbed, and the vessel is fully exposed. The walls of the abdomen, too, are opened at a part where it is less likely that hernia will ensue. But further trial must determine its merit. The following is the manner in which it was performed by Mr. Stanley at St. Bartholomew's Hospital in 1846, as detailed by Mr. Skey.

The patient, a middle-aged man, was placed on the operating-table, with his body inclined over to the right or sound side. The shoulders and trunk were bent a little forwards, for the purpose of rendering the lumbar integument tense. The line of the last false rib having been ascertained, an incision of three or four inches in length was made from its cartilage or nearly its point, in a line downwards, and somewhat forwards, to the crista ilii. The skin and fascia, then the external oblique, internal oblique, and transversalis muscles were singly and successively divided. The external incision was then carried along the line of the crista ilii, to the extent of about three inches more, and the division of the three muscles from the bone completed. There was but little blood lost. Returning to the situation of the first incision, Mr. Stanley then divided the transversalis fascia to the entire limit of the external wound. He then raised the mass of intestine enveloped in the peritonæum, and pushed it inwards, bringing into view the psoas magnus, left ureter, and finally the common iliac artery, around which he passed a ligature, without apparent difficulty.

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[*] The common iliac artery was tied by Mr. A. M. Edwards, of Edinburgh, in a case in which an aneurysm of the external iliac artery had burst internally, and the patient was bleeding to death. Mr. Edwards made the incisions described in the text, and with great difficulty reached the common iliac artery through a mass of clots, with his left forefinger. Having commanded the artery, the clots were turned out, and a ligature passed. Unluckily the patient died of secondary hæmorrhage from the ruptured aneurysm. Possibly he might have recovered had a ligature been placed also below the aneurysm; but at all events, imminent death was averted, and life prolonged for twenty-four days. Edinburgh Med. Journal, Jan. 1858.

[†] Med. Chir. Trans., vol. xvi.

III. THE INTERNAL ILIAC ARTERY.—Of the seven cases in which this artery has been tied for disease of its branches four have recovered.

The operation is necessarily attended with the greatest difficulty, on account of the position of surrounding parts. The internal iliac vein is closely in contact with the artery, each vein being a little posterior to the corresponding artery and to its right side, while each artery crosses the course of the external iliac vein. Then the internal iliac veins have their coats very thin, they lie loosely about the artery, and are joined by other veins of large size, so that no sharp instruments should be used in the latter part of the operation. It has been found in old subjects that the peritonæum has not escaped laceration, while being separated from its connections, even with the greatest care. Taking these circumstances into consideration, together with the fact that the artery may be shorter than usual, (it is very irregular), and that it may lie deep in the pelvis, several very excellent surgeons have expressed their conviction that under most circumstances it will be more prudent to tie the common iliac, although the direct supply of blood to the leg should be cut off.

The artery and vein are covered by, or surrounded with, a proper sheath. The ureter is, in some subjects, closely connected with the artery; usually it is placed internal and a little posterior.

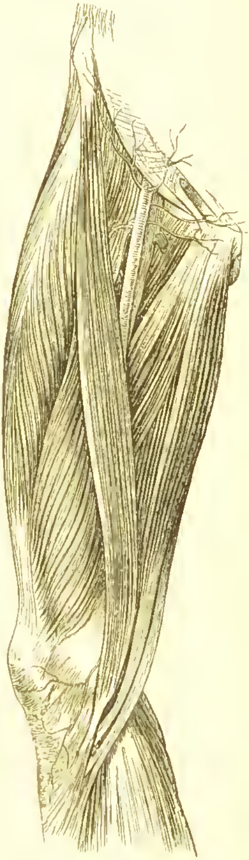
The operation described for tying the common iliac is that by which this vessel may be the most readily reached, and it has the advantage of enabling the common trunk to be tied in case the operator should afterwards desire it. While the vessel is being secured, it should not be immoderately pulled, as the ilio-lumbar artery may be torn through. In all these operations the advantage of the patient being under the influence of chloroform, whereby respiration goes on tranquilly, and the descent of the intestines is to a great extent prevented, must be obvious.

We may add, that the aorta may be reached by the same operation by which the common iliac is tied, should it be necessary to do so, and that, as Mr. Guthrie suggests, it may be possible to reach either common iliac from the *opposite side* of the pelvis, should the position and size of an aneurysm render it impossible to do so on the same side.

IV. THE GLUTÆAL artery may be tied by placing the patient on his face, with the toes turned inwards, and making an incision from an inch below the posterior spinous process of the ilium, and an inch from the sacrum, towards the great trochanter. This incision should be about four inches long. The fibres of the glutæus maximus having been cut through or separated to the like extent, and a strong fascia beneath having been cut through, the vessel will be found emerging from the upper part of the sciatic notch. The **Sciatic** artery may be found by making an incision through the same parts and for the same extent, but an inch and a half lower down. Both these operations are extremely difficult, from the great depth to which the dissection must be carried, the unyielding nature of the surrounding parts, and the hæmorrhage from the numerous blood-vessels that must necessarily be wounded. They should be attempted, however, in case of wounds; but for aneurysms of these arteries, it is necessary to tie the internal or common iliac.

SECTION IV.—THE FEMORAL AND ITS BRANCHES.

I. The **Femoral Artery** extends from Poupart's ligament to the junction of the middle with the lower third of the thigh, where it passes through the adductor magnus muscle into the ham, and receives the name of popliteal. Its course is as nearly as possible indicated by a line drawn from the middle of Poupart's ligament to the inner edge of the patella, supposing the knee to be bent and the thigh turned outwards. It is accompanied by its vein, which lies first to its inner side and then behind it, and still further down to its outer side. In its upper half it is covered by no muscle; in its lower half it is concealed by the sartorius, behind which it lies against the bone in a dense fibrous sheath, formed by an interweaving of the tendinous expansion of the adductor with that of the vastus internus. The long saphenous nerve, a branch of the crural, enters this tendinous sheath, and lies on the outer side of the artery. The saphena, the great cutaneous vein of the leg, the homologue of the cephalic in the upper extremity, ascends the thigh in a course parallel to that of the artery, but internal to it, and enters at the saphenic opening two inches below Poupart's ligament. In the case of stabs in the thigh, it is well to bear in mind the possibility that the profunda may be the vessel



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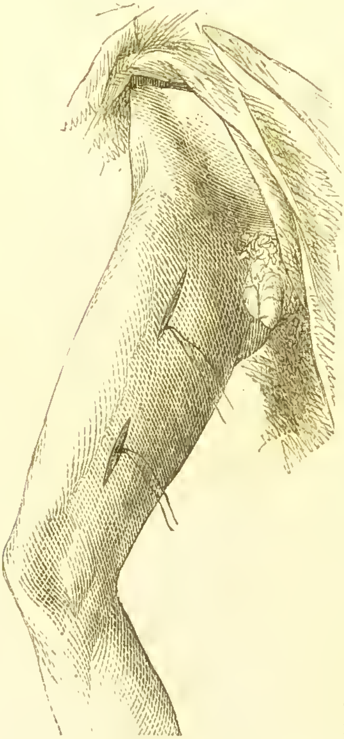
injured.* It arises from the femoral, about two inches below Poupart's ligament, and runs down the thigh behind the femoral, and separated from it, first by the femoral vein, then by the adductor longus tendon. Aneurysm of the profunda is not unknown. Nor must surgeons forget the possibility of varieties in the femoral artery, and that there may be two branches of nearly equal size, instead of one trunk.

The best place for the application of ligature, in cases of popliteal aneurysm, is the lowest part of the upper division of the artery, just before it is crossed by the sartorius. It is far enough from the aneurysm for the vessel to be healthy, and low enough to avoid embarrassment with the profunda.

To tie the Femoral Artery in its upper division.—The course of the vessel having been ascertained by its pulsation, an incision three or four inches in length should be made over it, about two or three inches below Poupart's ligament. The fat and superficial fascia must next be divided to the same extent. Some lymphatic glands will be met with here, and the saphena vein may be seen, but it generally lies much to the inner side of the incision. The fascia lata may now be divided to the same extent as the skin; the sartorius should be gently drawn outward (the sheath of this muscle should not be opened, as it would complicate the operation), and the pulsation of the artery felt for—its sheath should be opened at the lowest part of the wound sufficiently to admit the aneurysm-needle. There is always a risk of transfixing the vein and passing the ligature through it—an accident liable to be followed by fatal pyæmia. The best way of avoiding this accident, is to use a blunt aneurysm-needle, stiff enough not to bend; to pass it from the inner side, and to hold the inner cut edge of the sheath with forceps, and make it tense. Greater care will, of course, be necessary, if there has been an extension of inflammatory action to the sheath, with infiltration or thickening.†



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* See the cases at p. 302 and p. 306.

† It may be mentioned as a fact, that in two patients, in whom Mr. Haynes Walton tied the femoral artery for popliteal aneurysm, after it had been sub-

To tie the Femoral Artery in the lower part of its course.—Turn the limb a little outwards, bend the knee, and raise the leg on a pillow. Make an incision three inches long, half in the upper third of the thigh, half in the lower, and in a direction midway between the front and back surfaces, through the skin and superficial fascia, taking all care to avoid the saphena vein. Divide the deep fascia on a director to the same extent. Now will be exposed the tendinous interweaving of the adductor muscles and vastus internus, that forms the tendinous sheath for the artery; which is covered with more or less areolar tissue. At the posterior part of the wound lies the edge of the sartorius muscle. When this muscle is not seen, it should be searched for, because it forms a good landmark. Let the edge of the wound be drawn aside, then clear away the areolar tissue with care, and at the upper part of the space seek for the long saphenous nerve as it is passing through the aponeurosis of the adductors to gain the tendinous sheath of the vessels. Introduce the director where the nerve enters, and when the sheath is divided, the artery will very readily be found in a posterior position. The femoral vein is behind it. Sometimes the aponeurotic expansion of the tendinous sheath is higher than usual, and in this case the nerve may perhaps not be readily found. It is hardly necessary to allude to the possibility that the anastomotica magna might be taken up instead of the femoral artery: this branch arises from the trunk just before the latter perforates the adductor magnus to become the poplitæal.

The ligature should be applied on the upper portion of the artery.

II. THE POPLITÆAL artery may be tied by cutting through the skin and fascia lata for the extent of three inches on the outer border of the tendon of the semi-membranosus muscle, the patient being placed on his face, with his knee straight. On pressing that tendon inwards, the artery may be felt. Its vein, which lies superficial and rather external to it, must be cautiously separated and drawn outwards, and the needle be passed between them. This operation is very seldom performed. The writer lately witnessed an accident in the person of his friend Dr. Norton, by which it would be very possible for the poplitæal vessels to be wounded. In drawing a tight cork, by means of a common corkscrew, from a bottle held between the knees, the bottle was crushed, and the sharp edges driven between the inner hamstrings and the bone into the poplitæal space. The patient was most kindly and skilfully attended by Mr. Hodgson and Dr. E. Smith, and made a good recovery; but the hæmorrhage was immense, and the danger for a time great.

III. THE POSTERIOR TIBIAL ARTERY.—As we have often said, a wounded artery should, if possible, be tied at the wounded part; and in most cases the wound may be enlarged, and its track pursued till the bleeding vessel is reached. Yet there are exceptions to this latter rule;

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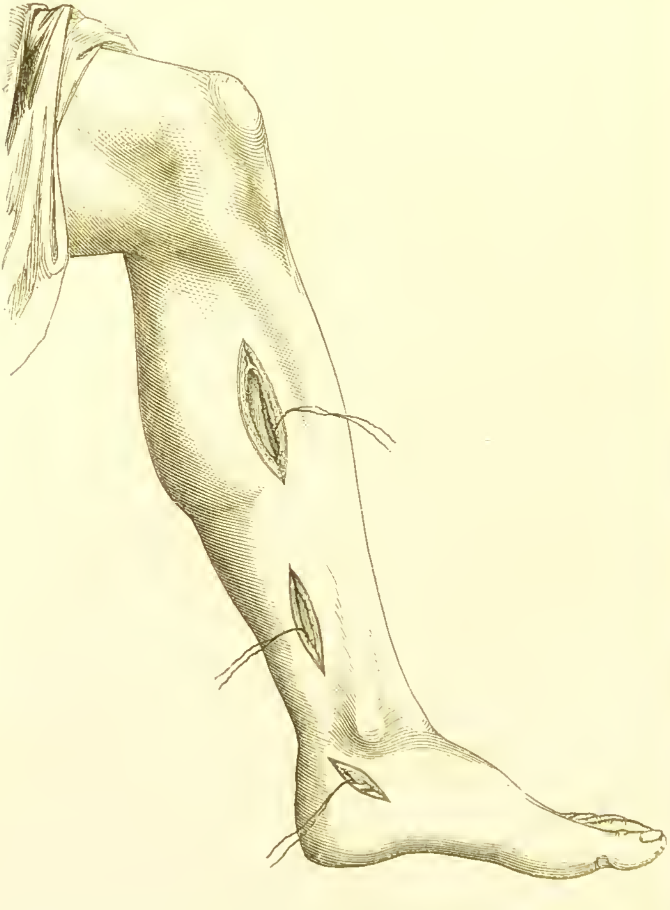
jected to pressure unsuccessfully,—in one instance for more than six weeks,—there were no structural changes in the parts that had been compressed.

for example, the posterior tibial or peronæal artery may be wounded by a narrow instrument thrust through from the front of the leg; and to meet such cases, as well as others in which these vessels may require ligature for nævus, the surgeon must be prepared to cut down upon them from the calf.

To tie the Posterior Tibial in the upper part of the leg.—The course of the artery corresponds with a line drawn from the middle of the poplitæal space to the middle of the space between the heel and inner ankle. The patient should lie on his back, with the injured limb resting on its outer side, the knee half bent, and the foot on a pillow, and the heel raised, in order to relax the muscles of the calf to the utmost.

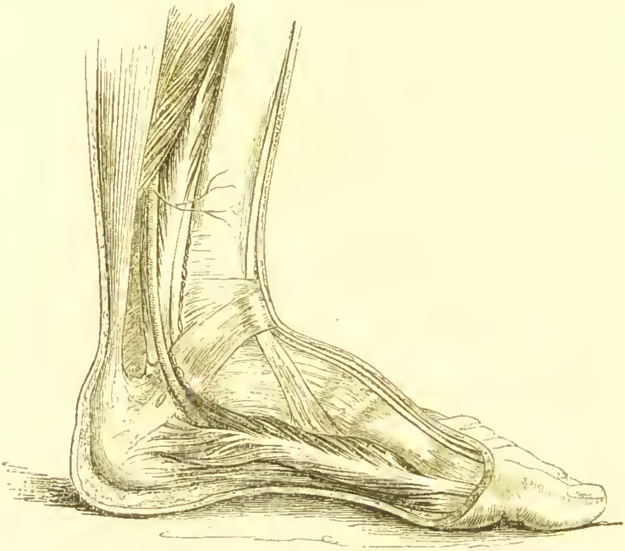


Supposing the leg to be divided into thirds, an incision four inches long, half in the upper, half in the middle third, and an inch from the inner edge of the tibia, should be made through the skin and superficial fascia. When the calf is very large, the cut should be taken more than an inch from the tibia, and less when the calf is very thin. If possible, the saphena vein should be avoided. In the illustration are shown two converging branches of this vessel that were met with at the upper part of the wound. The deep fascia having been divided, and the muscles exposed, the edge of the gastrocnemius is to be drawn aside, in order to expose the solæus. The fibres of the solæus are next to be severed to the extent of the first incision, until the fascia covering its anterior surface is seen, and then this is to be pinched up, perforated, and divided on a director. The cellular fascia, which intervenes between the superficial and deep muscles of the calf, and surrounds the vessels, must now be torn through, and the artery will be exposed lying on the tibialis posticus. Its two veins, of uncertain size, are in very close contact with it, and not unfrequently surround it by anastomoses. The nerve is on the outer side of the artery. If the artery is not readily found, and there should appear to be want of room to look for it, some of the fibres of the solæus may be cut across.

Instead of directing the solæus to be cut, some operators have proposed to separate its tibial origin from the bone. If this be done, the first incision should be made higher up, and nearer to the tibia. The objections to it are, that in case of injury, when the muscles are swollen and infiltrated with blood, it would be very difficult to distinguish between the attachments of the solæus and those of the flexor longus digitorum and tibialis posticus; so that all of the muscles of the leg might be detached, and the interosseous membrane reached, instead of the artery. Again, supposing the solæus to be correctly separated from the bone, it is no easy matter to draw the muscle sufficiently aside to expose the artery.

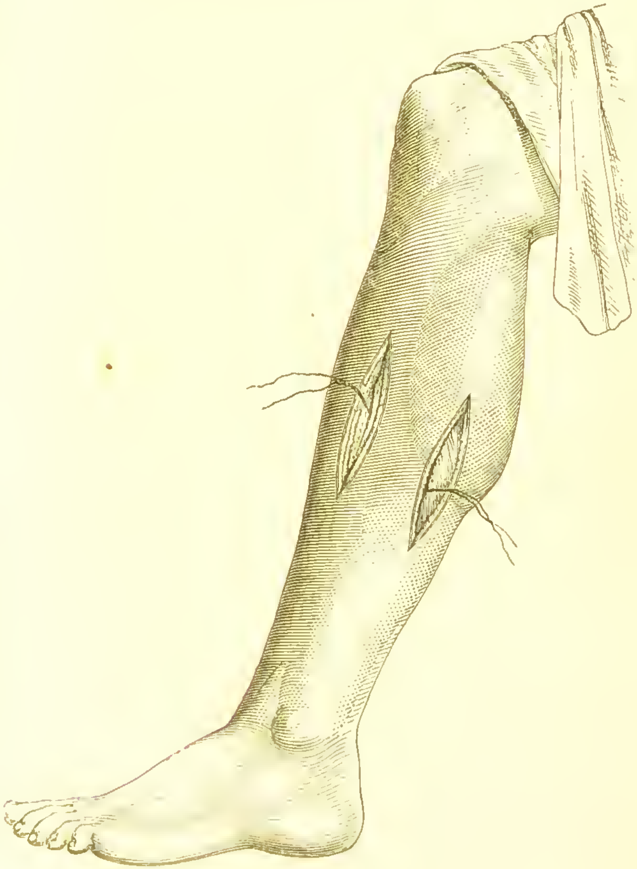
This operation is considered by Mr. Guthrie to be so "painful, difficult, bloody, tedious, and dangerous," that he proposes to reach the artery by making a perpendicular incision six or seven inches in length, at the back of the leg, through the skin, gastrocnemius, plantaris, and solæus; then the fascia will be exposed with the artery beneath it, and the nerve to the outer side. Perhaps this operation cannot be spoken of in much more complimentary terms than the preceding one.

To tie the Posterior Tibial in the middle of the leg.—An incision must be made three inches long, half in the middle third of the leg, half in the lower, and midway between the inner edge of the tibia and the inner border of the tendo Achillis. It is often impossible to avoid cutting through the internal saphena vein. The fascia covering the edge of the tendo Achillis must be divided on a director. A second fascia, the deep one of the tendo Achillis, is often met with, and must be treated in like manner. Whether one or two of these structures be seen, depends on the line of the incision, for at a little distance from the tibia, the two are, to use an anatomical expression, blended. The artery surrounded more or less by fat, which is a peculiarity in this situation, will be found along the inner edge of the flexor longus digitorum, accompanied by its two veins. The nerve is to the outer side. It must be remembered that, in the upper part of the leg, the posterior tibial nerve lies to the inner or tibial side of the artery; it soon, however, passes over, and inferiorly lies to its outer or fibular side.



To tie the Posterior Tibial at the ankle.—The vessel is here comparatively superficial. An incision is made two and a half inches long, in the groove, midway between the anterior edge of the internal malleolus and the extremity of the heel, commencing near the tendo Achillis. The superficial fascia having been divided, the strong and dense fascia which adheres to the sheaths of the tendons, and covers the vessels and nerves in this situation (which is, in fact, the internal annular ligament), must be very carefully divided on a director, as well as the origin of the abductor pollicis; and the artery should be looked for, surrounded by the venæ comites. The following is the order of the muscles, vessels, and nerves in this situation:—The tendons of the tibialis posticus and flexor digitorum communis are close to the malleolus internus. At about a quarter of an inch behind, there is the posterior tibial artery, on each side of which is a vein; a little behind is the posterior tibial nerve, and half an inch nearer to the heel is the tendon of the flexor longus pollicis. Much pains should be taken to avoid opening the bursæ around the tendons of the tibialis posticus and flexor longus digitorum respectively, or interfering with the sheath of the flexor longus pollicis. The line of incision advised is, on this account, to be preferred to that across the direction of the artery, that in a circular form around the malleolus, or that parallel to the tendo Achillis.

IV. THE PERONÆAL ARTERY.—The trunk of this vessel is often absent, its place being supplied by branches from the posterior tibial artery. Sometimes, on the contrary, it is very large at the lower part of the leg, and supplies the place of the posterior tibial. To tie it, an incision should be made four inches long, almost in the centre of the leg, being about half an inch nearer the upper part, and an inch behind the external edge of the fibula. The border of the



solæus is to be sought for and separated from the peronei which encircle the outer side of the fibula, and it may be requisite to detach a portion of this muscle from the fibula, to expose the flexor longus pollicis; the fibres of which must be separated longitudinally, first with the director, then with the handle of the scalpel, and the artery sought for about the centre, where it will be near the edge of the fibula. At the lower portion of the incision, the vessel is covered by the bone. Directly that the flexor proprius pollicis is exposed, the great toe should be bent to the utmost, in order to relax the muscle and facilitate the separation of its fibres.

If in the case of wound, with arterial hæmorrhage, the posterior tibial is cut down upon, and found intact, the incision may be extended, so as to allow the peroneal to be reached, by separating the superficial from the deep muscles of the calf, and raising the flexor proprius pollicis.

V. The Anterior Tibial Artery.—A line drawn from the head of the fibula to the base of the great toe will be parallel to the course of this artery.

To tie the vessel in the upper part of the leg, an incision four inches long, or even longer, should be made through the skin, midway between the spine of the tibia and the external edge of the fibula, half of which should be in the upper third of the leg, and half in the middle.

The intermuscular septa, between the tibialis anticus and extensor longus digitorum, must be sought for, raised on a director, and divided. It will facilitate the future steps of the operation to cut the fascia a little transversely at one or both extremities of the incision. The heel should be fully brought down, and the muscles then separated with the finger, from below upwards.

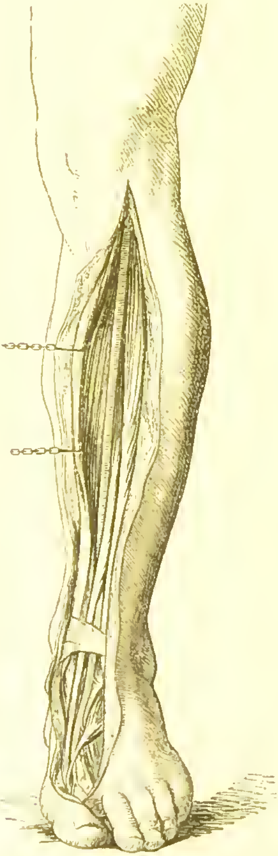
It must not be forgotten that at the lower part of the incision, the extensor proprius pollicis is to be separated from the tibialis anticus, as about the centre of the leg it intervenes between the extensor communis digitorum and tibialis anticus. The artery is deeply seated, lying on the interosseous membrane, accompanied by its two veins, and having the nerve in front and in close contact. The nerve is superficial in its entire course, and often changes its situation from one side to another.

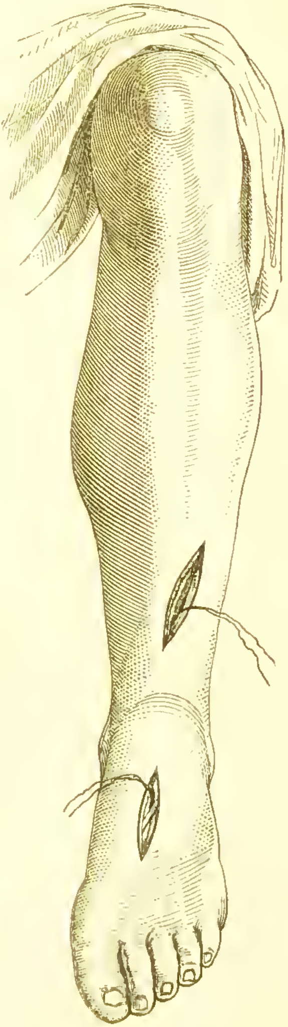
To tie it in the lower part of the leg.—An incision three inches in length, commencing at about the junction of the middle with the lower third of the leg, just half an inch external to the spine of the tibia, must be made obliquely upwards and outwards, as is shown in the second illustration (p. 713).

The fascia covering the tibialis anticus must then be divided, and the artery will be found lying on the lower portion of this muscle which separates it from the external surface of the tibia, surrounded by the venæ comites, and with the nerve directly in front.

Should it be found necessary to tie the artery lower down, the tendon of the extensor proprius pollicis had better be drawn to the outside, while that of the tibialis anticus is drawn in the contrary direction, and the connecting fascia divided. Here the vessel rests on the tibia.

VI. The Dorsal Artery of the Foot can rarely require to be tied. This vessel, superficial as it be, is, from its diminutiveness and the tightness of the fascia on the dorsum of the foot, very difficult to be





taken up even in the dead body. The posterior extremity of the interosseous space, between the first and second metatarsal bone, being found, an incision should be carried directly upwards for two inches or more. The fascia having been divided on a director, the tendon of the extensor longus pollicis and the inner tendon of the extensor brevis digitorum will be exposed, between which the artery lies. The last-named tendon is a certain guide, as it is first external to the vessel.

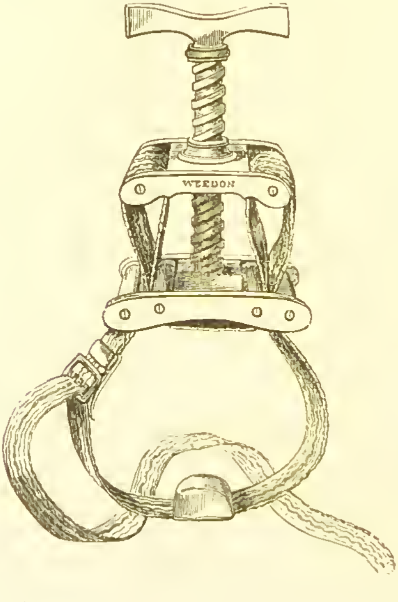
In wounds of the arteries in the sole of the foot (except perhaps of the external plantar, opposite the base of the little toe), before enlarging the wound with the view of securing the bleeding point, methodical pressure should be applied after the manner recommended at p. 303; if that fails, the posterior tibial artery should be tied behind the inner ankle, and the anterior tibial on the dorsum of the foot likewise, if necessary. In wounds also of either of the tibial arteries inflicted on children in the operation of dividing the deep tendons for club foot, pressure should have a fair trial.

CHAPTER VI.

AMPUTATIONS.

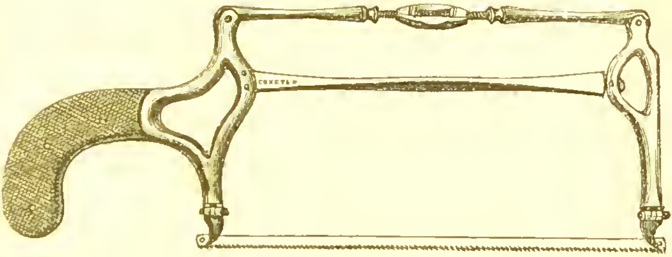
I. Amputation of the Thigh.—It will be convenient to describe this amputation first; and to embody in the description of it such general precepts as are applicable to the other amputations.

In the first place, the surgeon should have his tourniquets, amputating knives, saws, artery-forceps and tenacula, ligatures, bone-forceps, sponges, and curved needles threaded (or *wired*), close at hand on a tray, arranged in due order; and he should see with his own eyes that every requisite is at hand before he begins.



In this, as in every other operation, it is necessary to place the patient in a convenient posture, so that the operator may not be obliged to stoop. For amputation of the thigh, the patient may be placed on a bed, or on a table covered with a folded blanket; the diseased leg should project sufficiently over the edge, and should be supported at the knee by an assistant, who sits on a low stool in front; and the sound limb may be secured to one of the legs of the table with a handkerchief.

For amputation of the thigh, in an adult, the surgeon should have a long, straight, sharp-pointed knife. Instead of the common amputating saw, he may, if he pleases, use the instrument here depicted, and invented by Mr. Butcher of Dublin, although it is in excision of the ends of bones that it is most particularly useful.



It will be seen that the blade, which is 8 inches long, and only ·25 inch in breadth, is most tensely stretched between two upright bars, by a screw in the middle of the uppermost cross bar. The tension, combined with the fineness of the teeth, renders it a capital cutter, whilst from the outset of the teeth, and narrowness of the blade, it cannot well become locked. Moreover it can, when the screw is reversed, be turned in any direction, and be there fixed, so as to cut backwards or sideways.*

Then measures must be adopted for compressing the main artery, and preventing too great loss of blood. This may be done, either by pressure with the hand, or with the tourniquet.

Pressure with the hand on the main arterial trunk, if effected by a steady assistant who can be trusted, is sufficient in most cases; and if the limb is amputated so high up that the tourniquet cannot be applied, there is of course no choice; the femoral artery must be compressed against the ramus of the pubes. Both hands should be used for this purpose. Either the thumbs, or else the tips of the fore, middle, and ring fingers in a line should compress the vessel, and when one hand relaxes a little, the other should press more firmly. The handle of a key covered with lint is sometimes used.

The *common tourniquet* consists of three parts: a pad, to compress the artery, which should be firm, narrow, and flattish; a strong band which is buckled round the limb; and a bridge-like contrivance, over which the band passes, with a screw, by turning which the bridge is raised, and the band tightened. The pad should always be placed so as to compress the artery against the bone. Instead of a pad *attached* to the band, it is preferable to use a small, firm roller, about an inch thick; to put this lengthwise over the main artery, and secure it by a turn of bandage; and to apply the band of the tourniquet over this. The band should first of all be buckled tightly; then by turning the screw a very powerful degree of force is exerted. The screw may be put over the pad, or on another part of the limb; but it should always be put opposite the buckle of the band. The advantage of the tourniquet is, that it compresses the smaller arteries as well as the principal trunk; its disadvantage is, that it arrests the venous circulation, and causes a greater loss of venous blood; wherefore, it should never be constricted tightly until the incisions are just commencing.

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* The saw depicted above differs in some respects from that described by Mr. Butcher, Dublin Journ. Med. Sc., Feb. 1855. Weiss has another modification of it, suggested by Mr. Busk.

Amputations may be performed either, 1, by cutting from the skin towards the bone with a circular sweep of the knife, or with two oval semicircular sweeps; or, 2, by transfixion and cutting flaps outwards; or by a combination of either method. The flap operation has been of late the favourite; it is more brilliant; and it enables the surgeon to select a flap where he pleases, so that when the flesh on one side of the limb is destroyed by disease or injury, the end of the stump may be covered with a flap taken almost entirely from the sound side, and greater length of limb may be preserved. But it is generally admitted that the circular, although a slower and less showy operation, produces on the whole better stumps than the flap operation, as usually performed.

The aim of the surgeon should be to produce a good, useful stump; and not to execute a pretty-looking manœuvre. He must be careful to have skin enough to cover the flesh, and flesh enough to cover the bone. If the bone is inclined to project it should be shortened at once; and the same with muscle or tendon, and especially with nerves, which should always be cut short if they project.

Mr. Teale, of Leeds,* declares that the mortality of the amputations of the thigh and leg is nearly one in three; and that the stumps of those who escape are generally unsatisfactory, and unable to bear pressure. In order to diminish the mortality, and produce a more useful stump, he proposes to amputate by means of a long and a short rectangular flap. (See p. 719, 724.) The long flap is to be formed out of such parts as do not contain the principal blood-vessels and nerves, and is to be long enough to fall easily over the end of the bone. Its length and breadth are equal to half the circumference of the limb: it is therefore a perfect square. The short flap is one-fourth its length. The long flap is folded over the end of the bone, and united by suture, as shown at p. 719. No dressing is used by Mr. Teale; and he orders the stump not to be lifted for many days. He believes the advantages of this plan to be, that tension is avoided by the ample size of the long flap; that this, folding over the end of the bone, soon acquires organic union with it, and seals up its veins; that the limb is not disturbed by lifting and dressing, and the veins consequently are early closed; and that the end of the bone is covered by parts free from large vessels and nerves, and that the cicatrix does not adhere to it.

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* On Amputation by a long and a short Rectangular Flap, Lond. 1858.

In this, as in all other operations, we suppose the patient to be under the influence of chloroform; unless there is some rare and special reason to the contrary.

1. *Circular Method.*—The surgeon stands on the outer side, and uses his left hand to grasp and steady the part which he is to amputate. The artery must be compressed by one of the methods before described, and an assistant must grasp the limb with both hands, so as to draw up the skin as high as possible. Then the surgeon commences by putting his arm under the thigh, and makes an incision at one sweep, completely round the limb, through the skin and fat down to the fascia. The knife of course cuts from heel to point. The assistant is now to draw the skin further up, the retraction being aided by a few touches with the knife; and then the knife, being put close to the edge of the retracted skin, is to be made to divide everything down to the bone by another clean circular sweep. The next thing is, to separate the muscles from the bone for another inch or two with the point of a knife, especially those connected with the *linea aspera;* and then the periosteum having been divided by one more sweep, the muscles are to be well drawn up from the bone, either by the hands of the assistant or by the *retractor,* a piece of linen with a longitudinal slit in it. The saw must be used to divide the bone: it should be held perpendicularly or nearly so: it should be used very lightly, and the last few strokes should be excessively short and gentle, that the bone may not be splintered. If it is, the irregular part must be removed by the forceps. The femoral artery should now be tied, its orifice being seized and slightly drawn out by forceps; and afterwards any large branches that appear in the muscular interstices. Then all compression should be *suddenly ceased,* so that any arteries that are liable to bleed may do so, and be tied at once. Hæmorrhage from large veins is to be restrained by elevating the stump, and making compression for a short time with the finger. If, however, nothing else will do, they must be tied. Any obstinate oozing from small vessels should be restrained by sponging with cold water, or perhaps by a touch with arg. nitras. So soon as bleeding has ceased, a light bandage may be passed round the limb above the stump, and the edges of the wound should be nicely adapted with sutures and strips of plaster. The edges are to be brought together in a straight line, which may be made either perpendicular or horizontal, the latter, however, being the better plan.

The patient should then be removed to bed, and the stump be supported on a pillow covered with oil-cloth or gutta-percha. No other application will be needed save a good flake of fine wadding to exclude the air, and absorb discharge. Pain may be allayed by an opiate. The stump may remain as it is for some days, the cotton being changed, and the discharge wiped occasionally from its surface. But after from four to six days, sooner or later, according to the quantity of the discharge and the feelings of the patient, the dressings should be changed, the straps being taken off and replaced one by one, with care not to disturb the ligatures, and the hands of an assistant being employed to support the edges, and prevent their falling asunder. At the subsequent dressings, the points to be attended to are, to renew the light bandage occasionally, which was passed round the stump soon after the operation, in order to support the muscles, and prevent their retraction—to bring together the edges of the wound with adhesive straps, to press gently out all collections of matter, and take care that there is no *bagging;* —to use some antiseptic if need be—to remove the ligatures when loose—(that on the femoral artery should not be disturbed for a fortnight)—and to accelerate cicatrization by the nitrate of silver, or other stimulants, if the granulations appear languid.

If the patient is *very emaciated.* the circular incision may be carried down to the bone at once without ceremony, because in such patients the muscles always retract greatly. Sir C. Bell recommended the skin not to be divided quite circularly, but the knife to be inclined a little, so as to make two oval flaps. The same may be done also in dividing the muscles.

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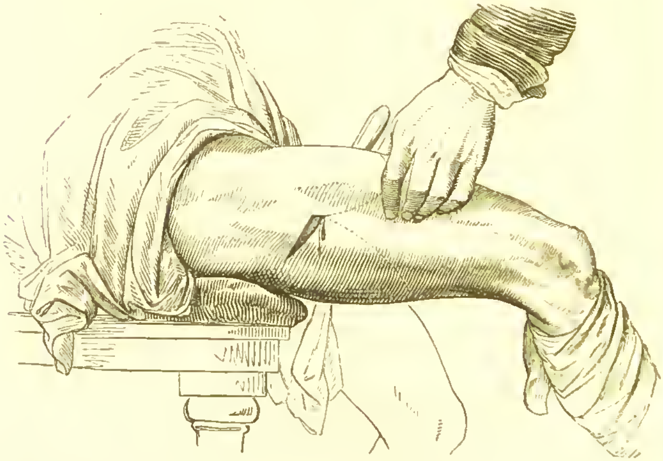

2. *Flap Operation.*—The flaps may be made, either from the inner

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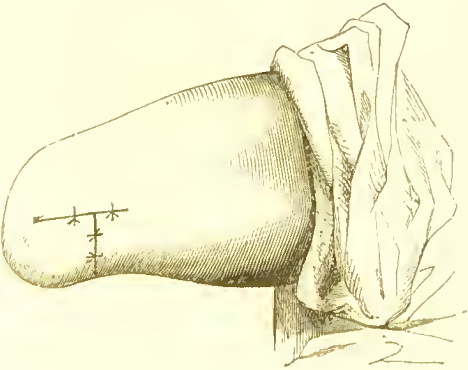
* This cut represents the surgeon as standing on the inner side; it is, however, more convenient on the whole that he should stand on the outer side. The knife should be carried along close to the bone for an inch or more before it is made to cut the flap. Mr. Haynes Walton says that it is better to make the lower flap first, since thus, the integuments being relaxed, it is easier to shape out the upper flap accurately.

and outer, or from the anterior and posterior aspects of the limb. The latter way is the more convenient if the amputation is low down; but the former, if it is in the middle or upper third. In performing this operation, the surgeon, standing as before, grasps the flesh on the anterior surface of the limb with his left hand, and lifts it from the bone; then passes his knife horizontally through it—carries the point over the bone, pushes it through the other side of the limb as low as possible; then makes it cut its way out upwards and forwards, so as to make the anterior flap. In amputating the right thigh, the knife should be passed behind the saphena vein. It is again entered a little below the top of the first incision, passed behind the bone, brought out at the wound on the other side, and directed so as to make a posterior flap in the direction of the dotted line. Both flaps are now drawn back; the knife is swept round the bone to divide any remaining muscular fibres, and the bone is sawn through.

In the same manner flaps may be made from the inner and outer sides of the limb, the surgeon first grasping the flesh, and transfixing it, and cutting a flap on one side of the bone, then passing the knife close to the bone on the other side (without again piercing the skin), and making another flap.

3. *Teale's Operation.*—The surgeon is recommended to begin by marking out the flaps with ink. Taking the circumference of the limb at the point where the bone is to be sawn, half of this will be the length and breadth of the flap. One line is to be traced on the inner side, as near as may be to the femoral vessels, without including them in the flap; a similar parallel line on the outer side, and a line of equal length joining their lower extremities. A transverse line may then be drawn to show the place of the short flap, which should be one



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[*] This cut, copied from Mr. Teale's book, shows the flaps put together by sutures.

fourth the length of the long one. "The operator begins," says Mr. Teale, "by making the two lateral incisions of the long flap through the *integuments only*. The transverse incision of this flap, supposing it to run along the upper edge of the patella, is made by a free sweep of the knife, through the skin and tendinous structures, down to the femur." But should the lower transverse line fall across the patella, the skin must be dissected off, and the cut be carried down to the femur, above its upper edge. "This flap is completed by cutting the fleshy structures from below upwards, close to the bone." The posterior short flap, containing the large vessels and nerves, is made by *one sweep* of the knife down to the bone; the soft parts being afterwards separated from the bone close to the periosteum, as far upwards as the intended place of sawing.'

SECTION II.—AMPUTATION OF THE HIP-JOINT.

This operation is requisite in cases in which the upper extremity of the thigh-bone is smashed, and in which the soft parts are so injured that it is of no use to attempt excision. "No man," says Mr. Guthrie, "should suffer amputation at the hip-joint when the thigh-bone is entire. It should never be done in cases of injury when the bone can be sawn through immediately behind the trochanter major, and sufficient flaps can be preserved to close the wound thus made. An injury warranting this operation should extend to the neck or head of the bone, and it may be possible, as I have proposed, even then to avoid it by removing the broken parts."*

It is generally by flaps; either anterior and posterior, or lateral. The writer saw it performed in the year 1835 by Mr. Herbert Mayo at the Middlesex Hospital in the following manner:—

The femoral artery was first tied immediately below Poupart's ligament. This was the rule of that day, but was quite unnecessary. The artery should be compressed during the operation, and its cut orifice be tied immediately afterwards.

The patient being in the recumbent posture at the edge of the table, and the limb held out horizontally, a long knife was thrust through the limb immediately on the inner side of the joint, and carried forwards and inwards, and made to cut the inner flap from the adductor muscles. This flap should be immediately grasped by an assistant, who should compress the femoral artery.

In the next place, Mr. Mayo cut into the hip-joint with a short strong curved knife, and severed the ligamentum teres and the muscles attached to the digital fossa. Lastly, putting in the long knife over the trochanter, he cut downwards and outwards to make the outer flap.

This amputation, excluding the preliminary tying of the femoral artery, was most brilliantly accomplished in twenty-eight seconds;

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* Guthrie, Commentaries, 6th edit., p. 63.

yet would scarcely in the present day be justified, since it was performed upon a young woman to get rid of neuralgia from a stump, which had undergone two previous amputations.

Of the method by anterior and posterior flaps, a very good example is afforded by a case of Mr. Tatum's at St. George's Hospital in July, 1855. The thigh having been slightly bent and abducted, the knife was entered at the outside at the junction of the upper and middle thirds of a line drawn from the anterior superior spine of the ilium to the great trochanter. It was carried obliquely inwards and downwards immediately in front of the joint, and brought out about two inches below the tuberosity of the ischium.

"Cutting my way out," says Mr. Tatum, "I made a large anterior flap, which was at once firmly grasped, so as to prevent the possibility of hæmorrhage, and drawn upwards. The anterior part of the capsular ligament being laid bare was easily divided; the head of the bone was then partially dislocated by rotating the limb outwards and extending it backwards; the ligamentum teres was at once cut through, and the dislocation of the thigh-bone completed. The knife was then carried through the joint and over the trochanter, and the posterior flap was made. In doing this I took care to have this flap somewhat small and thin, well knowing by experience that a large posterior flap tends by its weight to drag the cut surfaces apart in the progress of healing. As I completed the posterior flap, dry sponges were stuffed into the wound by assistants, and thus all hæmorrhage was at once stopped." Plenty of ligatures securing every bleeding vessel including the femoral vein; sutures and plasters, completed the operation. The patient, a lad of 16, left the hospital in a month.

In this case, as in one operated on by Mr. C. G. Guthrie, the entire thigh-bone was removed in order to give the patient a greater chance of security from the return of cancer than would have been given by amputation through the affected bone. In any such case, the surgeon probably will be able to plan his lines of incision as he pleases; and the limb can be moved in any direction, to facilitate his proceedings. Not so in cases in which there is extensive destruction of soft parts and smashing of the neck of the bone. Here the surgeon must be guided by the direction in which he can secure the best covering of skin.*

SECTION III.—AMPUTATION AT THE KNEE-JOINT.

This operation may be substituted for amputation in the lower third of the thigh, in cases in which excision of the knee-joint is impracticable.

1. *Syme's operation.*—A semicircular incision is made through skin and fascia over the patella; next, the knife is thrust horizontally across

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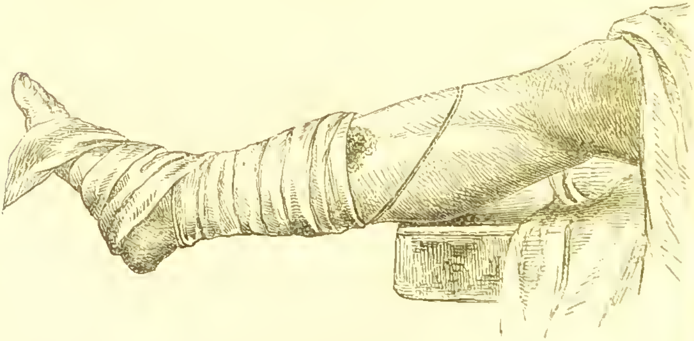
* For details of other modes of performing this operation see Guthrie's Commentaries and South's Chelius, vol. ii.

immediately behind the joint, and is made to cut a long flap from the calf of the leg; next, the anterior flap being lifted up, the extensor muscles are severed from the upper border of the patella; the remaining soft parts are divided, and the femur sawn through the condyles, immediately above the joint.

2. If circumstances permit it, an anterior flap may be made including the patella, by a semicircular incision through the tissues in front of the joint, beneath the patella from the posterior part of one condyle of the femur to the other. Then the ligamentum patellæ is cut through, the patella lifted with the anterior flap, the joint opened by cutting through the lateral and crucial ligaments; and lastly, a sufficiency of under flap cut from the calf. The interarticular cartilages should always be removed, and the surface of the patella, or femur, if diseased. The popliteal artery should not be wounded above the part at which it is severed. The patella should be brought down over the end of the femur.

SECTION IV.—AMPUTATION OF THE LEG.

1. *Oval Amputation through the calf.*—An oval incision is made in the direction shown in the cut, through skin and fat; these are thoroughly drawn back; the incision is carried upwards obliquely through the gastrocnemius to the bones, so as to make a posterior flap; this being well pulled up, the remaining soft parts around and between the bones are divided; lastly, the bones are sawn through. The integuments are brought together in a transverse line.



2. *The flap operation* is performed by Mr. Fergusson in an elegant and expeditious manner, thus:—He first places the heel of the knife on the side of the limb farthest from him, and draws it across the front of the limb, cutting a semilunar flap of skin; when its point has arrived at the opposite side, it is at once made to transfix the limb: this stage of the operation is represented in the figure below; and then

the posterior flap is cut. The surgeon must take care not to get his knife between the two bones. When the operation is performed high up, the popliteal artery will be divided instead of the two tibials. The tibia, however, should never be sawn higher than its tuberosity, or the joint will be laid open. The fleshy mass of the gastrocnemius may require to be cut out, to make the flap thinner. If low down, the *tendo Achillis* will require to be shortened after the flap is made. The flap is to be brought forwards, and confined by a stitch or two, the line of junction being horizontal.

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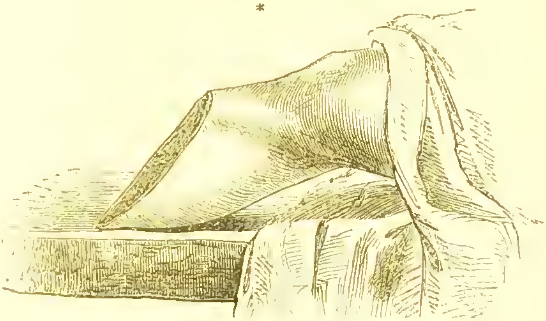

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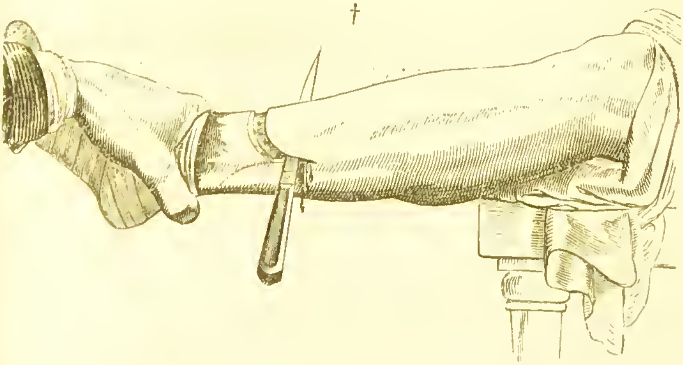

3. *Circular Method.*—The artery being under command, as in amputations of the thigh, and the leg being placed horizontally, one assistant supporting it at the ankle, and another holding it at the knee and drawing up the skin, the surgeon makes a circular incision through

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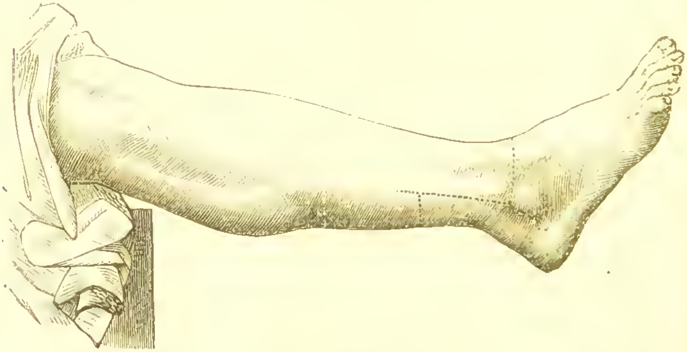
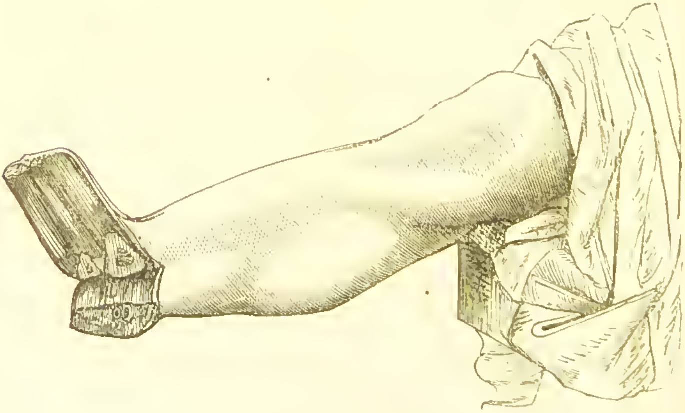
* Oval amputation, before the stump is put together.
† Flap amputation; the limb transfixed.

the skin, four inches below the tuberosity of the tibia. The integuments are next to be dissected up for two inches, and turned back; and the muscles are to be divided down to the bone by a second circular incision. Then a long slender double-edged knife, called a catline, is passed between the bones to divide the interosseous ligament and muscles, and both bones are sawn through together, the flesh being protected by a retractor, which should have three tails. The spine of the tibia, if it projects much, may be removed with a fine saw or bone nippers, and care should be taken not to leave the fibula longer than the tibia, or it will give much trouble. The anterior and posterior tibial and peronæal arteries, and any others requiring it, being tied, the stump is to be treated as directed after amputation of the thigh. The teguments should be put together transversely.



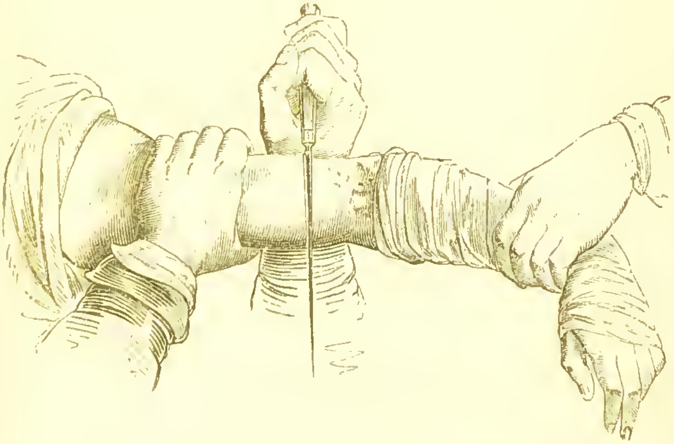
4. *Teale's Operation.*—The length and breadth of the anterior flap



are to be determined and marked out as before described, p. 716. The two lateral incisions are first made through the skin; and the transverse one down to the bone; then the long flap is dissected up, and with it, all the tissues in front of the bones and interosseous membrane; including the anterior tibial vessels, which are divided once only. The short posterior flap is then made by one cut down to the bones, and is to be dissected clean from the bones and interosseous membrane up to the point of sawing. The cuts are reduced from Mr. Teale's book.

SECTION V.—AMPUTATION OF THE ARM.

In amputations of the upper extremity, the flow of blood may be sufficiently commanded by compressing the artery above the clavicle, or in the arm. If it is thought proper, however, the tourniquet may be applied so as to compress the artery against the humerus.



1. *Circular.*—The arm being held out, and an assistant drawing up the skin, one circular incision is made through the skin, which being forcibly retracted, another is made down to the bone. These incisions should be made with two slight divergences, so as to cut the skin and muscles rather longer in front and behind than at the sides. The subsequent steps are precisely similar to those in amputating the thigh.

2. *Flaps.*—The knife is entered at one side, carried down to the bone, turned over it, brought out at a point opposite (the vessels being left behind for the second flap), and then made to cut a neat rounded anterior flap two or three inches long. It is next carried behind the

bone to make a posterior one of equal length; and is lastly swept round the bone, to divide any remaining fibres. The division of the bone, ligature of the arteries, and treatment of the stump as before.

SECTION VI.—AMPUTATION AT THE SHOULDER.

This may be performed in several manners. 1. The patient being seated in a chair and well supported, or, which is better, being placed on a firm table, with the shoulder elevated, and projecting beyond its edge, and the subclavian artery being compressed, the surgeon enters a long straight knife at the anterior margin of the deltoid muscle, an inch below the acromion. From this point he thrusts it through the muscle, across the outside of the joint, and brings out the knife at the posterior margin of the axilla. If the left side is operated on, the knife must be entered at the posterior margin of the axilla, and be brought out at the anterior margin of the deltoid muscle. Then, by cutting downwards and outwards, the external flap is made. The origins of the biceps and triceps, and insertions of the infra and supra spinatus are next cut through, and the joint is laid open. Finally, the blade of the knife being placed on the inner side of the head of the bone must be made to cut the inner flap.

2. The covering for the exposed part of the scapula in the preceding operation was obtained from the deltoid. But it may also be obtained from the muscles in front or behind, supposing the deltoid to be implicated in the disease or injury which demands the operation. One elliptical incision may be carried from beneath the middle of the acromion to the posterior border of the axilla, and another to the anterior border. These flaps being dissected up, the head of the bone may be turned out of the socket, and the remaining soft parts be divided; or the bone may be sawn through just beneath its neck. An assistant should be directed to grasp the flap which contains the axillary artery so soon as it is divided, because the pressure above the clavicle is generally not sufficient to stop the circulation entirely.

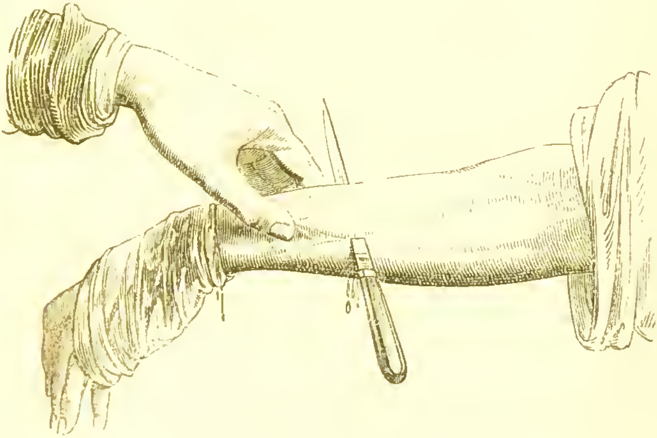
SECTION VII.—AMPUTATION AT THE ELBOW.

This is performed by passing the knife through the muscles in front of the joint, and cutting upwards and forwards, so as to make a flap from the fore-arm. Then the operator makes a transverse incision behind the joint. He next cuts through the external lateral ligament, and enters the joint between the head of the radius and external condyle, then divides the internal lateral ligament, and, lastly, saws through the olecranon, the apex of which, with the triceps attached to it, is of course left in the stump.

SECTION VIII.—AMPUTATION OF THE FORE-ARM.

This operation should always be performed as near the wrist as possible.

1. *Circular.*—The limb being supported with the thumb uppermost, and an assistant drawing up the skin, a circular incision is made through it down to the fascia. When the skin has again been retracted as much as possible, the muscles are divided by a second circular incision; the interosseous parts and the remaining fibres are next cut through with a catline; the flesh and the bones are then to be sawn through together, the saw being worked perpendicularly. The radial, ulnar, and two interosseous arteries require ligatures.

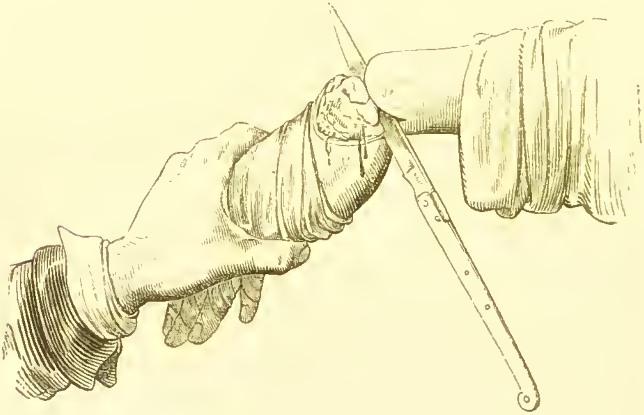


2. *Flaps.*—The limb being placed in a state of pronation, the surgeon makes a flap from the extensor side, just as is represented in the annexed cut;. and he then transfixes the flexor side, and makes the other flap; taking care not to pass the knife between the bones whilst performing either transfixion. The interosseous parts are next divided. the flesh drawn upwards, and the bones sawn through. If the tendons project, they must be shortened.

Teale's operation is performed, *mutatis mutandis,* like that of the leg; and that of the upper arm like the thigh.

SECTION IX.—AMPUTATION AT THE WRIST.

1. *Circular.*—The skin being pulled back, a circular incision is made a little below the level of the line that separates the fore-arm from the palm of the hand. The external lateral ligament is then cut through, and the knife carried across the joint, to divide the remaining attachments.

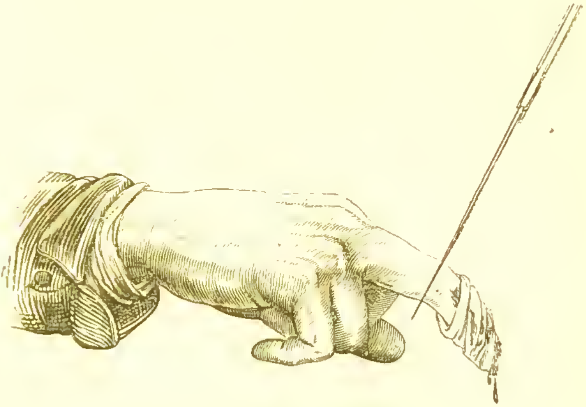


2. *Flaps.*—A semilunar incision is made across the back of the wrist, its extremities being at the styloid processes, and its centre reaching down as far as the second row of carpal bones. This flap being dissected up, the joint is opened behind, the lateral ligaments are cut through, and the knife, being placed between the carpus and bones of the fore-arm, is made to cut out a flap from the anterior surface of the palm, as represented in the above figure. The tendons must be shortened, and the skin brought together by sutures.

SECTION X.—AMPUTATIONS OF THE HAND.

1. AMPUTATION of the *fingers or thumb at their last joint* may be performed thus:—The surgeon holds the phalanx firmly between his finger and thumb, and bends it, so as to give prominence to the head of the middle phalanx. He then makes a straight incision across the head of the middle phalanx, so as to cut into the joint, and takes care to carry it deeply enough at the sides to divide the lateral ligaments. The joint being then thoroughly opened, the bistoury is carried through it, and made to cut a flap from the palmar surface of the last phalanx,

sufficient to cover the head of the bone; and it is better to leave too much than too little.



If, however, the joint cannot be bent, this operation may be performed thus: The surgeon holding the phalanx firmly, with its palmar surface upwards, first passes his knife horizontally across the front of the joint, the flat surface towards it, and cuts out the anterior flap; then divides the lateral ligaments and the remaining attachments with one sweep of the knife.

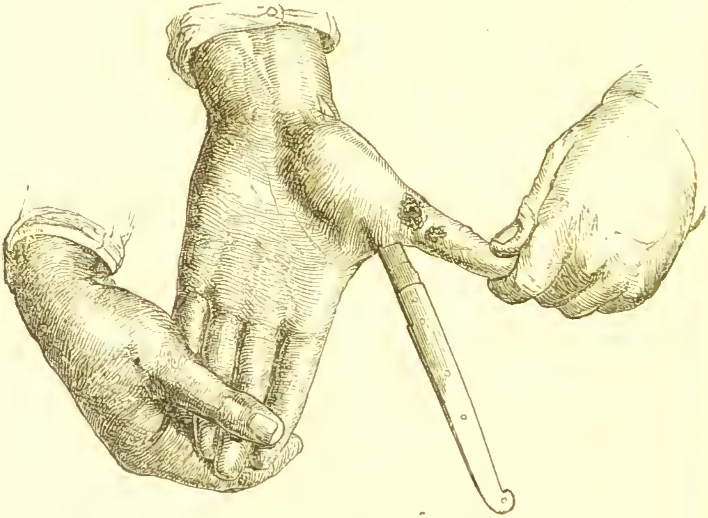
II. AMPUTATION AT THE SECOND JOINT of the fingers or thumb may be performed in the same manner.

III. It is always expedient to save as much as possible of the fingers and thumb; consequently in cases admitting of it, flaps may be made from the soft parts wherever practicable, and then the bone cut with forceps. Teale's plan of making a flap from the dorsal surface has been adopted by Mr. S. Hey, with great advantage.

IV. AMPUTATION OF A FINGER AT THE METACARPAL JOINT may be effected thus: The surgeon should make out accurately the situation of the joint between the head of the metacarpal bone or knuckle and the base of the first phalanx. If he looks for the transverse lines on the palmar aspect, that mark the flexure of the joint and divide the finger from the palm, he may calculate that the metacarpo-phalangeal joint, at which he is to amputate, is about half an inch nearer to the wrist than this line is. Then he may begin by making a semilunar incision on one side of the prominence of the knuckle, a quarter of an inch beyond the joint, and should carry it round in front of the joint to the web on the other side, thus encircling two-thirds of the joint. The finger should now be drawn to the other side, the extensor tendon cut through, and the point of the bistoury passed into the joint, and made to divide its ligaments. This will allow the head of the bone to be turned out, so that the bistoury being placed behind it may cut through the remaining attachments and make another flap. This operation may also be performed by making an incision on one side of the joint (as in the method just described), and then bringing it across the palmar surface, and round the other side, to terminate where it began. The tendons and ligaments are now to be divided, and the head of the bone turned out. The digital arteries must be tied, and after bleeding has ceased, the wound may be closed by confining the adjoining fingers together.

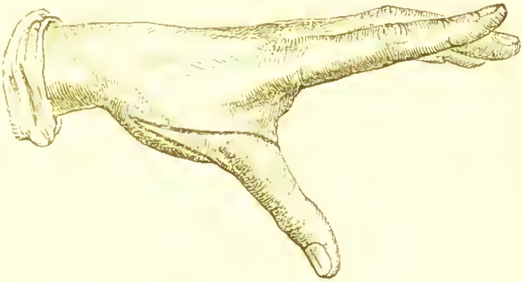
V. AMPUTATION OF THE METACARPAL BONE OF THE THUMB is performed thus: The thumb being held out, a bistoury is inserted near the metacarpo-phalangeal joint, its point is thrust between the bone and the muscles of the ball of the thumb, and as close to the bone as possible, and brought out just above the articulation with the trapezium. This step is shown in Fig. 1. Secondly, the bistoury is made to cut its way outwards. Thirdly, an incision, beginning at the upper extremity of the last, is carried along the bone, and round and behind the metacarpo-phalangeal joint to meet the other incision at its commencement (see Fig. 2, p. 731). Fourthly, the bistoury should be passed along the metacarpal bone to clear it from its remaining attachments; and lastly the bone should either be cut through, or disarticulated. If the latter proceeding is necessary, the bone must be forcibly abducted, and the ligaments on the inner side of the metacarpo-trapezial joint be cut through first.

1.



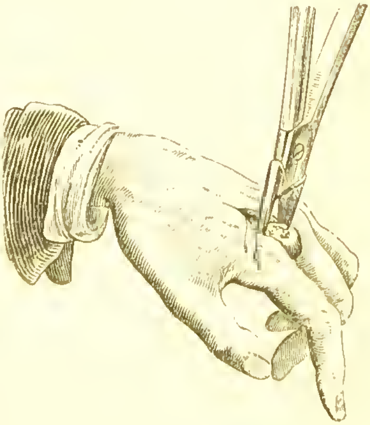
When the metacarpal bone of the thumb alone is diseased, it should, Mr. Fergusson advises, be extirpated alone, and its phalanges should be preserved. The bone should be exposed by means of an incision along its radial margin; then its articulation with the phalanges should be divided; and lastly, it may be turned out and separated from the trapezium; taking care not to wound the radial artery where it passes between the first and second metacarpal bones.

2.



VI. AMPUTATION OF THE METACARPAL BONE OF THE LITTLE FINGER is performed thus:—An incision is made along the ulnar border of the dorsum of the bone, and is carried round the root of the little finger. The skin and flesh are dissected off, as closely as possible, and the bone divided. (See amputation of the metatarsal bone of the great toe.)

VII. AMPUTATION AT THE HEAD OF A METACARPAL BONE is effected by making an incision on each side of it (as in amputation of the fingers at the joint, but extending rather higher up), and then cutting through the bone with the cutting-forceps. Mr. Fergusson recommends the head of the metacarpal bone to be removed in almost every instance where the entire finger is abstracted, because the deformity is much less. But the part need not be removed high enough up to divide the transverse ligament. Care must be taken during the cure to keep the fingers parallel, and prevent them from crossing at their tips.

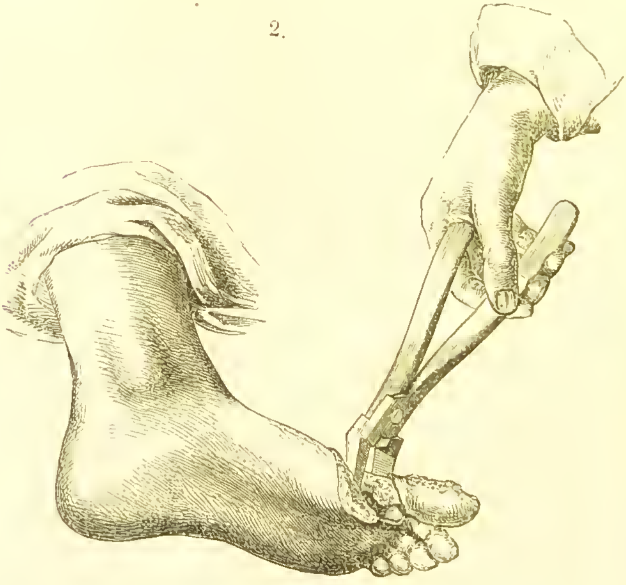


If a part or the whole of the shaft of one of these bones is to be removed also, an incision should be made along its dorsum, to the point where the two former ones meet; and then the flesh being dissected away on either side, the bone may be cut through or disarticulated according to circumstances.

SECTION XI.—AMPUTATIONS OF THE FOOT.

1. AMPUTATION OF THE TOES at any of their joints is performed in precisely the same manner as amputation of the fingers. In removing a single toe from its metatarsal bone, the surgeon should take care first of all to ascertain the exact situation of the joint, which lies rather deeply. Moreover, he should not remove the head of the metatarsal bone, as he may of the metacarpal, because it is important to preserve the entire breadth of the foot.*

2.



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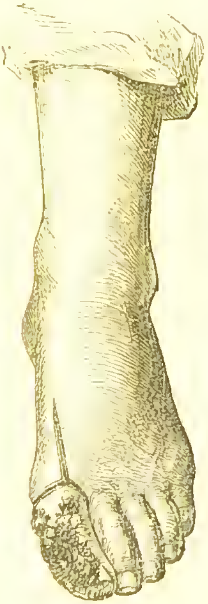
* Mr. Haynes Walton has favoured the writer with a valuable note to the effect, that it is desirable to explore the real seat and amount of disease about the tarsus, before performing amputation. For example, he had a case in which the *head of the metatarsal* bone of the great toe was suspected to be carious, and was condemned to be cut out; a serious operation, inasmuch as it takes away one of the three supports of the arch of the foot. But a free incision revealed disease in the first *phalanx* only. This was removed, and the patient recovered with the slightest possible limp.

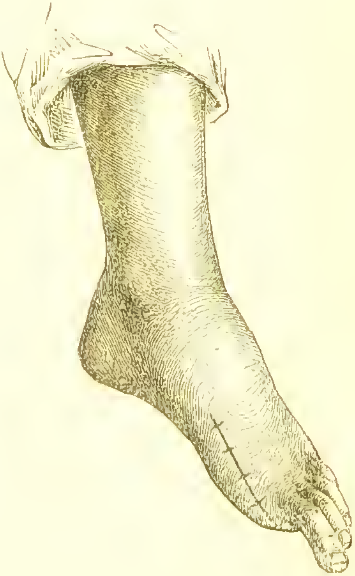
II. Amputation of all the toes at their metatarsal joints—an operation which may be requisite in cases of frost-bite—is performed by first making a transverse incision along the dorsal aspect of the metatarsal bones, dividing the tendons and lateral ligaments of each joint in succession; and then, the phalanges being dislocated upwards, the knife is placed beneath their metatarsal extremities, and made to cut out a flap from the skin on the plantar surface, sufficient to cover the heads of the metatarsal bones.

III. Amputation of the metatarsal bone of the great toe is performed precisely like the operation for the removal of the metacarpal bone of the little finger. An incision down to the bone with a scalpel, is carried along its dorsum and round the root of the great toe, as shown in Fig. 1. Secondly, the knife, which must be kept as close to the bone as possible, is made to dissect it out from the surrounding parts; thirdly, the bone is cut through with forceps, a part of the operation shown in Fig. 2. Vessels are to be tied, and the wound brought together as shown in Fig. 3. It may be observed that, in dividing the metatarsal bones of the great or little toes, or the metacarpal bones of the fore or little finger, care should be taken not to leave any prominent angle.

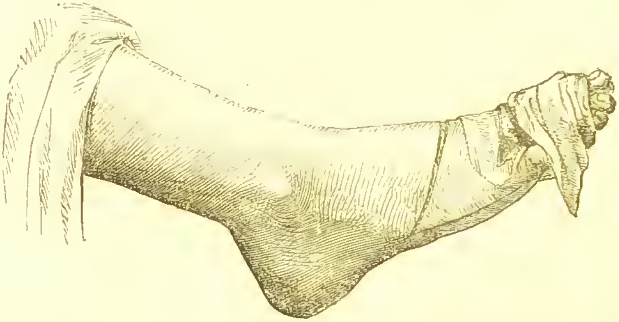
1.

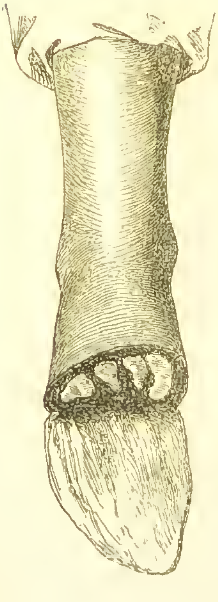


3.

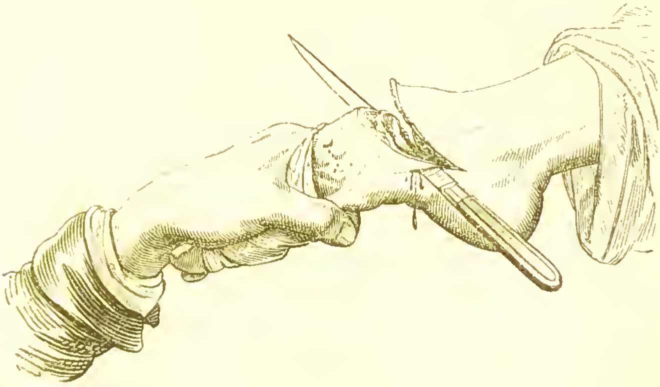


IV. AMPUTATION OF ALL THE METATARSAL BONES (*Hey's operation*) is performed in the following manner:—The exact situation of the articulation of the great toe to the inner cuneiform bone (to which the tendon of the tibialis anticus may serve as a guide) being ascertained, a semilunar incision, with the convexity forwards, is made down to the bone, across the instep, from a point just in front of the aforesaid articulation, to the outside of the tuberosity of the fifth metatarsal bone. The flap of skin thus formed being turned back, the bistoury is to be passed round behind the projection of the fifth metatarsal bone, so as to divide the external ligaments which connect it with the cuboid. The dorsal ligaments are next to be cut through, and then the remaining ones, the bones being depressed. The fourth and third metatarsal bones are to be disarticulated in a similar manner, dividing their ligaments with the point of the knife, and taking care not to let the instrument become locked between the bones. The first metatarsal is next to be attacked, and lastly, the second, the extremity of which, being locked in between the three cuneiform, will be more difficult to dislodge. Perhaps it may be convenient to saw it across. When all the five bones are detached, the surgeon completes the division of their plantar ligaments, and slightly separates the textures which adhere to their under surface with the point of the knife, and then, the foot being placed horizontally, he puts the blade under the five bones, and carries it forwards along their inferior surface, so as to form a flap from the sole of the foot sufficient to cover the denuded tarsal bones.





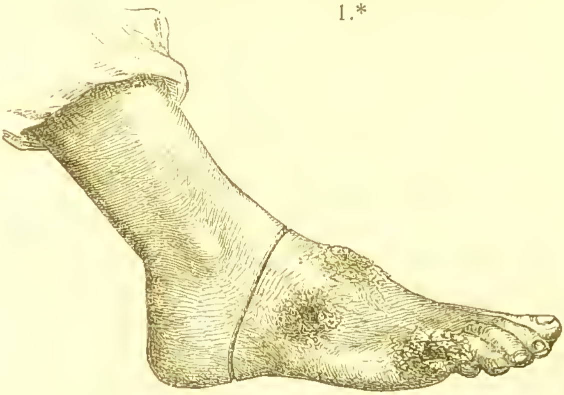
V. AMPUTATION THROUGH THE TARSUS, so as to remove the navicular and cuboid bones, with all the parts in front of them, is commonly called *Chopart's operation.* In the first place, the articulation of the cuboid with the os calcis (which lies about midway between the external malleolus and the tuberosity of the fifth metatarsal bone), and that of the navicular with the astragalus (which will be found just behind the prominence of the navicular bone in front of the inner ankle), must be sought for; and a semilunar incision be made from one to the other, as in the last-described operation. The flap of skin being turned back, the internal and dorsal ligaments that connect the navicular to the astragalus, are to be divided with the point of the bistoury, recollecting the convex shape of the head of the latter bone. The ligaments connecting the os calcis and cuboid are next divided, and lastly, a flap is to be procured from the sole of the foot. It may be expedient after this operation, to divide the tendo Achillis if the heel is drawn backwards.



SECTION XII.—AMPUTATION AT THE ANKLE-JOINT.

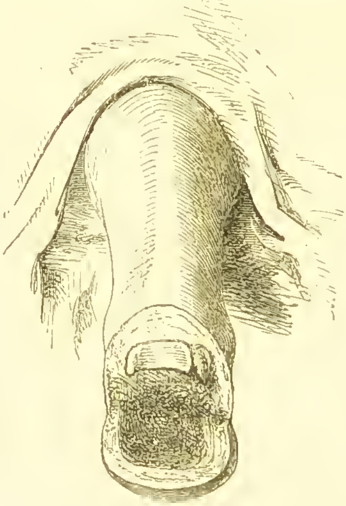
I. Syme's amputation.—The essence of this operation consists in the removal of the entire foot, and in preserving the integument of the heel as the most natural pad for the stump to rest upon. The incisions employed are different in the hands of various surgeons. But that generally adopted is represented in the next cut. The knife is carried round down to the bone. The ankle-joint is laid open in front, and its lateral ligaments divided. The os calcis is then dissected out, in which process, which is not easy, the knife should be kept close to the bone, so as not to wound the plantar arteries if possible. The malleoli are cut off smoothly, and if there is any disease of the ankle-joint, a thin layer of the end of the tibia should be removed; the posterior flap is then brought forward and retained by suture. The skin of the heel is rather liable to slough, and hence many surgeons

1.*



make the incision more oblique, so as to preserve more skin from the dorsum of the foot, and less from the sole.

2.



II. Pirigoff's amputation is theoretically more perfect than Syme's, inasmuch as it is easier to perform, leaves a longer stump better adapted to bear pressure; and does not disturb the tendo Achillis, nor, generally speaking, cause so much injury—nor is there the hollow flap. Instead of dissecting out the entire os calcis, the surgeon removes the anterior part of the bone, which supports the astragalus, and leaves the heel process.

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* Syme's amputation. No. 1. The incision. No. 2. The flap after removal of the os calcis.

M. Pirigoff began his first incision* close in front of the outer malleolus, and carried it straight down to, and transversely across the sole of the foot, then obliquely upwards and forwards to the front of the inner malleolus. It divides everything down to the bone; and the incision is brought obliquely forwards on the inner side, in order not to cut the posterior tibial artery before its division into its plantar branches. The ends of this incision are connected by a second semilunar one across it into the ankle joint, which is to be held with the foot extended. When the front of the joint is thus laid open, the lateral ligaments are divided; and then the posterior part of the capsule. Now with a narrow saw (such as Butcher's, p. 715) the os calcis is sawn through, from behind forwards and downwards. Then the malleoli are separated from the anterior flap, and sawn off, and a thin slice of the tibia if diseased. Lastly, the cut surface of the os calcis is brought into contact with the tibia; and the wound united with sutures.

SECTION XIII.—AFFECTIONS OF STUMPS.

I. It sometimes happens that the flesh shrinks away from the end of the bone, which becomes white and dry, and finally exfoliates. The nitric acid lotion is the best application.

II. PROTRUSION OF THE BONE is a very awkward circumstance. It not only greatly retards the healing of the stump, but produces a cicatrix which is thin, red, constantly liable to ulcerate, and unable to bear the least pressure or friction. The cause of the *conical stump*, as it is technically called, is generally a want of skin and muscle sufficient to cover the end of the bone. Sometimes, however, it arises from spasmodic reaction of the muscles, especially if they have not been properly supported by bandages during the cure. The remedy is simple; the bone must be shortened. This may be done in slight cases by making a longitudinal incision over the bone on the side opposite the vessels, and sawing off a sufficient portion of it, removing at the same time any diseased portion of the cicatrix. But if the projection is considerable the entire end of the stump must be amputated.

III. NEURALGIA of the stump is another very untoward event. It sometimes arises because the truncated extremities of the nerves (which after amputation always swell and become bulbous) adhere to the cicatrix, so as to be subject to constant compression and tension. Sometimes, however, it is entirely independent of any morbid state of the extremities of the nerves, but arises from some irritation in their course, or from some irritation, centric or excentric, of the spinal cord. Sometimes, again, no local cause whatever is detectable; and the pain is evidently connected with an hysterical state of the system. In any case the symptoms are extreme irritability and tenderness, paroxysms of violent neuralgic pain, and spasms and twitchings of the muscles, which not unfrequently retract, and cause the bone to protrude, and the stump to become conical.

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* See a very good account of this operation by Mr. Spencer Wells, Med. Times, 20th March, 1858.

Treatment.—1. Painting with tincture of aconite, or Scott's ointment, F. 160, spread on lint, and worn as a plaster; or the emplastrum saponis or plumbi, combined with a little belladonna or opium; tonics and aperients, together with change of air, sometimes suffice to remove the extreme sensitiveness of these as well as of other irregular cicatrices. 2. If the pain and tenderness are referred to one or two nerves only, their bulbous extremities should be cut down upon and removed. 3. If, however, the whole surface of the stump is implicated, or if the stump is conical, a second amputation may be resorted to.

CHAPTER VII.

EXCISION OF BONES AND JOINTS.

I. Excision of Bones.—We have already stated that bone when dead must be removed by operation, because nature seems not only to have provided no means of absorption, but the process of repair envelopes the dead portion in a sheath of new bone that renders mechanical extrusion most improbable. We also intimated that bone when infiltrated with unhealthy lymph, and softened or carious, has but slow power of recovery, and that extirpation of the diseased part is advisable. Bone may also be invaded by cancer or other tumours, which render removal necessary.

Accordingly there are very few bones in the body which have not been removed wholly or in part. Operations for this end are usually exceedingly difficult and laborious, and are anything but attractive to the lookers on. When the existence of a tumour, or of diseased or dead bone is ascertained, and its extent explored by probes, if there are sinuses which admit of it, a sufficient incision is made through the thickened parts; and it must be made where the bone is nearest the surface, and where important vessels and nerves are not in the way. Then if there is a shell of new bone it must be bored with trephines, or cut with forceps, or chisel, or gouge; and when the diseased part is exposed, it must be removed as it best may. In cutting it out from any adherent tissues, the knife must be kept close to it.

Of the removal of portions of the *cranium*, and of the upper and lower jaw, we have already spoken. The clavicle has been extirpated by Mr. Travers for a tumour; by Mr. Davie because it pressed on the trachea. (See pp. 226, 282.) The *scapula* was extirpated by Mr. W. Fergusson from a patient who had previously suffered amputation at the shoulder-joint: it has also been frequently extirpated alone for tumours. It is laid bare by a ⊢ incision; the acromion sawn through, the levator anguli, trapezius, and serratus divided, the mass lifted, the neck of the bone sawn, and the deltoid and remaining muscles divided. The *sternum* is occasionally perforated, and removed piecemeal. The *ribs* when carious present no difficulty. The pleura is usually thickened, except in the case of tumours. Portions of the ossa innominata have been taken away. The *coccyx* may require to be cut out for disease, or for neuralgia; and for the latter malady it is sometimes necessary to make a subcutaneous incision, so as to isolate the bone from all the surrounding tissues. Portions of each of the long bones are removed from time to time. Mr. Jones, of Jersey, has removed the *entire ulna;* the whole or greater portion of the fibula and radius, and considerable portions of the femur and tibia have also been taken away, in cases in which otherwise amputation would have been the only resource.

II. In like manner, in cases in which joints are hopelessly diseased, modern surgeons have substituted the cutting out the portions of diseased bone, for the cutting off the whole limb; and the results have been encouraging. It seems to be established, that excision is, on the whole, safer than amputation; less violence is done to the body, fewer great arteries and nerves are injured, and, what is of more consequence, fewer large veins are divided, and as the articular end of the bone only is sawn off, and the medullary canal not touched, there is less chance of pyæmia. Lastly, the patient is left with an imperfect limb, it is true, but with one, which, in most cases, is highly useful. What we say of excision for disease, applies with double force to excision for injury.*

III. THE ELBOW JOINT is one, the excision of which has been now for some years an established rule. The operation is performed thus. The patient is on his back chloroformed, and the arm held out in a prone posture by two assistants, one of whom holds the upper arm, the other the fore-arm. An incision through skin and subjacent textures is then made on the ulnar side of the dorsum of the joint; its centre about the level of the olecranon; its length from two to four inches; and it should be so planned as not to go into the groove where the ulnar nerve lies. A second incision, parallel to this, is made on the radial side, and a third transversely, severing the triceps from the olecranon. The ulnar nerve is gently drawn inwards and protected, the lateral ligaments severed, the elbow forcibly bent, so as to turn out the ends of the bones. The olecranon may now be cut off with forceps, and then it will be seen clearly what other portions of bone are denuded, softened, or necrosed, and they may be cut off with forceps or saw. Mr. Fergusson's Lion Forceps, p. 447, will be of great service in steadying the extremity of bone which is being removed. As much as is necessary, and no more, of the brachialis must be cleared from the coronoid process. The lower end of the humerus is next dealt with; if it requires to be cleared from the soft parts in front, the knife must be kept close to the bone; then as much as necessary, and no more, may be cut off. Arteries are now to be tied, and so soon as bleeding has ceased, the wound is to be brought together by sutures, and the arm laid in a half-bent posture either on an angular splint, well padded and covered with oiled silk, to which it is to be properly secured by bandages; or Mr. Butcher's box, with moveable sides, may be used; or Mr. Christopher Heath's splint, which secures, in the greatest perfection, the advantages of entire rest; the power of keeping the limb of any desired length, by means of the screws; the power of bending it to any angle by means of the central hinge; and the convenience of dressing the wound without disturbance. The cut explains itself.*

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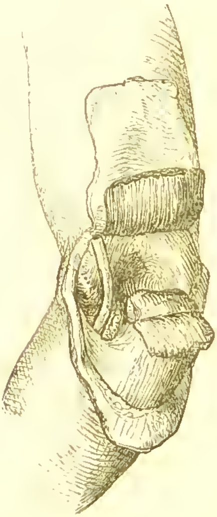
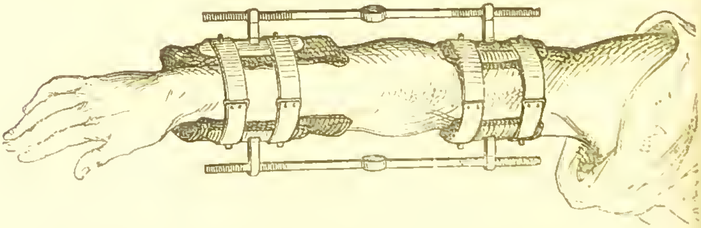
* A grenadier before Sebastopol received a wound in the popliteal space. All that was to be seen was a small orifice with inverted edges. On introducing the finger, the direction of the wound was found to be immediately forwards; pain was felt in the inner side of the head of the tibia, the joint was half bent, and could scarcely be moved. Hence it was presumed that the ball had lodged in the joint. On the third day amputation was performed. The ball was found impacted in the semilunar cartilage over the inner head of the tibia. On the third day after the amputation, secondary hæmorrhage from the femoral artery came on, and the patient quickly died. Dr. M'Cowan, who reports the case, says, very justly, that if excision had been performed as he himself had intended, at all events the immediate cause of the patient's death would have been avoided.—Medical Times and Gaz., March 1, 1856.





When the reparative stage has fairly set in, the joint should be moved from time to time to insure the formation of a flexible uniting medium or *false joint*.

There are many varieties in the plan of the incisions and the after steps of the operation which will readily suggest themselves. For instance, the incision may be one perpendicular one six inches or so in length—which is theoretically the best—or may be like X or ⊢, or a simple curved flap from side to side; or beginning with a single | the surgeon may enlarge it to ⊢ or H as he sees occasion. *Gouge forceps* may be of service in these and other like operations.

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* See Mr. Heath's paper, Lancet, 28th Nov. 1857.

IV. THE SHOULDER-JOINT may be exposed by making a perpendicular incision through the deltoid, three or four inches downwards from the acromion; and another from the extremity of the first incision upwards and backwards to the posterior border of the deltoid. The triangular flap, thus formed, is reflected upwards and backwards; the joint is laid open; the capsular tendons divided; the head of the humerus turned out and sawn off; and the glenoid cavity of the scapula, if diseased, may be removed by the bone-nippers or gouge. But as this operation is most frequently required in cases of gun-shot wound, the surgeon may vary his incisions, according to the extent and situation of the wound; and may make them of a V or T shape, or may make a simple curved flap, by cutting from near the coracoid process to an inch behind and below the root of the acromion.

V. EXCISION OF THE WRIST-JOINT.—This is an excision which has always been considered one of the least promising, because of the excessive complexity of the joints surrounding the diseased bones. Yet the surgeon will always do wisely to make every effort to preserve any part of the hand; for the removal of diseased parts cannot make the patient's case much worse, and there is always amputation as a last resource. The incisions and other steps of the operation must be various in almost every case, according to the place and extent of the disease, whether, for example, the ends of the radius and ulna, or the carpal bones only are diseased: no precise rules, therefore, can be laid down.

But the general principles should be those which guided Mr. Butcher of Dublin, during that operation on the carpus which is deservedly called by his name.* In this case the wrist-joint was excessively swollen, with numerous discharging sinuses around; the radio-carpal articulation grated on motion; a probe introduced into almost any sinus came into contact with roughened, crumbling, and broken-down bone; but the metacarpal bones and phalanges, the flexors of the fingers, and all the powers of the thumb were unimpaired. Having determined on operating, the first step was to make a curved incision, beginning a little below the wrist, two lines on the ulnar side of the extensor secundi internodii pollicis tendon, going down close to the carpal extremity of the metacarpal bones, and then sweeping upwards so as to finish below the end of the ulna fully half an inch higher than the point where it began. "The flap thus marked out," says Mr. Butcher, "was rapidly dissected up, and consisted of the integuments, areolar tissue, and extensor tendons of the four fingers, together with large deposits of fibrine." By the elevation of these soft parts *en masse* the diseased bones were at once brought into view. In the next place, the soft parts were cautiously separated from the ends of the ulna and radius, including the second extensor tendon of the thumb which was detached from its groove in the radius. Then the few ligamentous shreds which bound the diseased bones together were severed; their carious ends were made to project by bending down the hand; the soft parts in front were sufficiently detached by a few cautious touches with the knife, which was kept close to the bones so as not to injure the radial or ulnar artery; after this the ends of the bones were easily removed by Mr. Butcher's saw. Then the diseased carpal bones were dissected out, except the trapezium, which was sound; some of the thickened soft parts were cut away, the flaps laid down and secured, and the hand and arm put upon a padded splint in the prone position.

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* On Excision of the Elbow and Wrist-Joints, and the Preservative Surgery of the Hand, by Richard G. H. Butcher, Esq., Surgeon to Mercer's Hospital, &c., Dublin, 1855. Also Reports in Operative Surgery, 3rd Series, Dublin Quarterly Journ., Med. Sc., Feb. 1859.

The advantage of Mr. Butcher's mode of operating is, that it leaves the extensor muscles of the thumb intact; so that although the fingers will be of necessity stiffened in a bent position, yet with the aid of the thumb they will be available for writing and many other purposes. In a recent paper he gives a specimen of the writing executed by a sightly and useful hand, which would formerly have been amputated.

Other modes of operating, consist of longitudinal incisions on one or both sides of the wrist-joint; or of incisions on the dorsal and palmar aspects so planned as to go between the tendons without dividing them. No two cases are exactly alike. But the principles which should guide the surgeon are to take away nothing that can safely be left, and to leave the soft parts of thumb or finger, even if obliged to cut out joints or portions of bones. It is useful also to bear in mind the fact which Mr. Butcher has pointed out, of the independence of the muscles of the thumb from those of the fingers, so that either set may be hopelessly injured by disease, leaving the other almost unaffected.

VI. EXCISION OF THE HIP-JOINT.—We have spoken in a former page of the removal of the carious head of the thigh-bone after it has become dislocated by disease. Now for a few words on the much more formidable operation which has been performed in cases of injury.

When the head or neck of the femur has been broken by a musket ball, the patient may be seen, says Mr. Guthrie, lying in bed, with a small hole in front or at the back of the thigh, with no bleeding, and no pain, and nothing but inability to move the limb and to stand upon it; and yet this man will die inevitably after a few weeks of pain and suffering, unless his thigh be amputated at the hip, or unless the splintered bones be cut out.

Mr. Guthrie, in the Addenda to his Commentaries, tells us that this operation was performed at least six times before Sebastopol, in 1855, and although not one of the patients survived, yet there were plenty of causes besides the operation to account for their death. Mr. Blenkins, Mr. O'Leary, Mr. Crerar, Dr. Hyde, and Dr. MacAndrew were the operators.

The surgeon may, according to circumstance, make a long, straight incision down the outer side of the limb, beginning a little below the anterior superior spine of the ilium, and going down over the trochanter. The attachments of muscles having been severed from the trochanter, the bone is turned out of the wound by raising it at the knee, the shattered parts are sawn off, and the neck and head of the bone, if necessary, dissected out of the acetabulum. Or, the incision, as recommended by Mr. Guthrie, may be in the shape of a semilunar flap, beginning just over the inner edge of the tensor vaginæ femoris muscle, and curving downwards and outwards, so as to cross the bone at least an inch below the trochanter, whence it should turn upwards to the extent of about three inches. This flap, including skin, fascia lata, tensor vaginæ femoris, and part of the glutæus maximus, should be turned up, the muscles attached to the injured parts be divided, and the remaining steps of the operation be as before. As Mr. Guthrie observes, it will be possible, if the surgeon finds it desirable, on closer view of the injured parts, to convert this operation into that of amputation at the hip-joint.

VII. EXCISION OF THE KNEE-JOINT was first performed in 1762 by Mr. Filken, of Northwich, in Cheshire; it was subsequently performed twice by Mr. Park of Liverpool, twice by Sir Philip Crampton.

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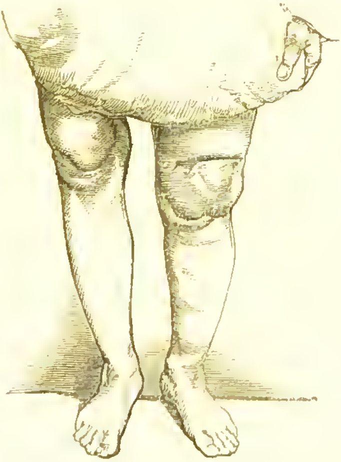

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* The above drawing represents a patient of Mr. Price's, a young woman æt. 26, whose left knee was excised in October 1856. The patella was retained; but was cut out after a year, because abscesses continued to form around it. "The limb," says Mr. Price, August, 1859, "is most serviceable, and the girl in active employment."

and twice by Mr. Syme. One of Mr. Park's cases was eminently successful, so was one of Crampton's. Park's patient, who was a sailor, was able to go aloft and perform the usual duties of his calling.

Altogether, there are records of 19 cases performed by British and continental surgeons up to the year 1830. Of these 19 there were only about 8 recoveries; the remaining 11 died, but not all from the operation.*

From 1830 to 1850 the operation was in abeyance, and almost universally condemned by teachers of surgery, until, in the latter year, it was revived by Mr. W. Fergusson, a revival which is one of the greatest triumphs of modern surgery. Next to Mr. Fergusson, Mr. Jones of Jersey, whose success in all departments of operative surgery would be called remarkable, were they not the natural results of great acuteness and energy; Mr. Page of Carlisle; the late lamented Mackenzie of Edinburgh, who lost his life in the Crimea; Dr. Pritchard of Filey; Mr. Evan Thomas of Manchester; Dr. Cotton of Lynn; Mr. Holt and Mr. Henry Smith, are entitled to the credit of having early performed this

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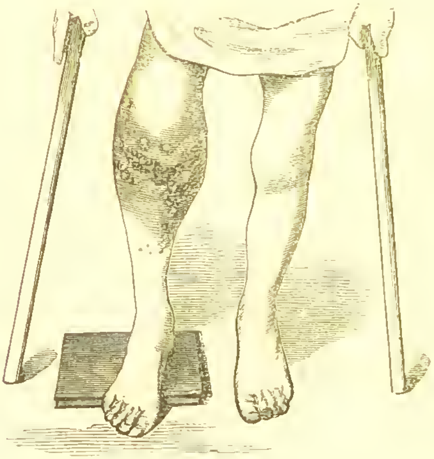

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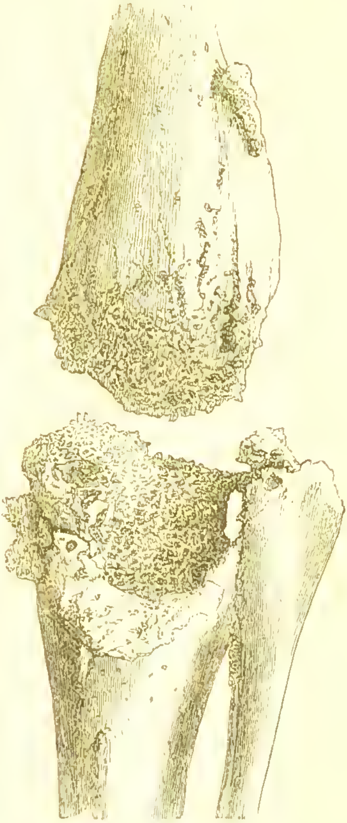
* Vide S. Cooper's Surgical Dict., art. Joints.

† This represents a boy, aged 9, whose knee was cut out by Mr. Price, July 20th, 1856: for a time he did well, but never had good use of the limb, which at the end of two years and three months presented the appearance shown above. The limb was then amputated, and he recovered. After the amputation, the ends of the bones which had suffered excision were macerated and are represented in the next cut. Evidently the causes of failure were the intensely strumous diathesis, the softened and unhealthy state of the bones, and the formation of numerous abscesses in the soft parts, which had been the seat of disease for four years before the excision. See Lancet, Nov. 27th, 1858.

operation with success. Dr. Murray Humphry of Cambridge, and Mr. Butcher of Dublin have also been frequent and successful operators.



The *cases in which* it ought to be performed are, generally speaking, such cases of injury or disease as would otherwise be submitted to amputation in order to save the patient's life, or enable him to enjoy it.

The *object* of the operation is to produce a firm and useful limb, slightly shortened, and with entire bony anchylosis, or fibrous union admitting of some small degree of motion at the situation of the joint.

But all cases are not suitable for excision. And those cases are unsuitable, and better adapted for amputation, in which either the *quantity* of diseased bone requiring removal is very great,—for then the case will probably not do well—or if it proceed to recovery, and the patient be young, the future growth of the limb may be prevented; or the *quality* of the disease may be such as experience has shown to be incompatible with the exudation of healthy material of repair.

This last is a point which has been very clearly stated by Mr. Price.* If the "white swelling" has begun with disease of the synovial membrane (see pp. 263, 269), or so-called ulceration of cartilage, the diseased joint surfaces may be cut off, and the case will do well; or if there be scrofulous exudation into the bone structure, and it be in one or more *circumscribed* masses, bounded by a layer of lymph and healthy bone, these masses, when laid bare by the section of the bone, may be gouged out, as a dentist would deal with a carious tooth, and if sound bone be left the case will do well.

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* Contributions to the Surgery of Diseased Joints, with especial reference to the Operation of Excision. No. 1. The Knee. By P. C. Price, Surgeon to the Great Northern Hospital, &c., &c., Lond., 1859.

Not so, if, as Mr. Price remarks, the scrofulous exudation be *diffused* throughout the cancellous tissue; if the whole area of the bone be enlarged and softened, with its cancelli filled with strumous deposit, and its periosteum thickened and separating. In such a case, the whole disease can scarcely be removed, and diseased bone is left, incapable of healthy exudation. Low inflammation, repeated abscesses, and fresh operations to remove carious or necrosed fragments will be the almost certain result, and if the patient do not die of exhaustion or pyæmia, he must go through amputation at last.

Here it may be observed, that since there are no absolute diagnostic marks of the various forms and degrees of joint disease, it may happen that the surgeon must sometimes come to a final decision after he has laid the joint open, and has removed a slice of bone. This point is clearly laid down by Mr. Butcher.* The patient, whilst under chloroform, suffers no prolonged shock; and if the bones are found extensively diseased, amputation should be performed at once. Mr. Fergusson has done this; and Mr. Hutchinson, a surgeon no less remarkable for his own successful operations, than for his zeal in collecting accurate statistics. In operating on a case which appeared to be suitable for excision, he found the cartilage gone, the joint surfaces carious, deep ulcers excavated in the patella and tibia, the cancellous structure of the femur infiltrated with yellow matter, and containing an ill-circumscribed abscess; and a second slice revealed no better state of things. Amputation, therefore, was immediately performed. The patient had lost nothing by the attempt to save his limb; and Pedantry only, complaining of such as "disturb her ancient melancholy reign," could object to the proceeding.

The *operation* consists, first, of one or more incisions for laying bare the joint. Mr. Fergusson makes an H incision in front of the joint; the lateral lines about four inches long; the cross cut running below the patella. The lateral should, as Mr. Butcher says, be placed far enough back to allow the discharge to run out freely, and prevent pouching of matter in the ham. Other surgeons have made a single semicircular flap, running below the patella, with upward extensions at its ends.

The next point is to raise the flap, including the patella, bend the joint, sever the lateral ligaments, very cautiously lay bare the popliteal surface of the femur, and cut off the articular surface. Here Butcher's saw will be useful, cutting from behind forwards. The cut should be parallel with the natural surface of the condyles, and all obliquity should be avoided, so that the sawn surfaces of bone may rest flat and evenly against one another. Then any carious spots must be gouged out, or, if need be, another slice removed; and now, too, the surgeon may convert his operation into an amputation if the state of the bone seems irreparable.

The tibia is then treated likewise. The patella, if healthy, may have its cartilage pared off: if ulcerated a little, the diseased surface may be cut out: if thoroughly soft and strumous, or even if doubtful, it should be removed. Perhaps it is the best plan always to do so. Then all diseased synovial membrane, and all thickened and infiltrated areolar tissue, should be trimmed off, so that the tissues which remain, both hard and soft, may be as healthy as possible. This is one of the points on which success depends.

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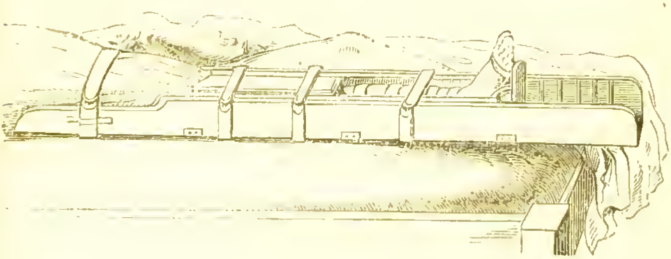
* Second Memoir on Excision of the Knee-Joint. Dublin Quart. Journ., Med. Science, Feb. 1857.

The next thing is to tie vessels and remove clots.

The next, to bring the limb into a straight position; which is to be accomplished by extension, under chloroform, from the foot, whilst the thigh is held steadily; and as this may be a matter of some difficulty, it may, as Mr. Butcher observes, be facilitated by division of the biceps and other ham-string tendons. This will insure greater freedom from displacement and spasmodic jerking. The cut surfaces of bone should be accurately adapted to each other; and here Mr. Butcher gives the caution to let no soft tissue be allowed to intrude between them. The edges of the flaps are brought together with sutures, and covered with lint or cotton.

In the next place the limb must be *put up*: and it is upon the details of this, and of the after-treatment, that the patient's safety will mainly depend. The wounded surfaces of bone must be in apposition, and at absolute rest; all possibility must be excluded of their slipping, starting, grating, jerking, or grinding against each other, or of the femur projecting. If they do, the exudation of repair must of necessity be destroyed and decomposed; and fetid suppuration, and possibly purulent absorption, or caries, will result.

It is universally agreed that the limb should be put up on the operating table before removal to bed. The leg should be nicely bandaged, and the hollows above the ankle padded. The engraving will show the solid look of a limb, after this operation, done up in the box employed by Mr. Butcher. It is well padded with horsehair; the sides can be let down by hinges, so as to give access to the wound: in other respects the cut explains itself.*



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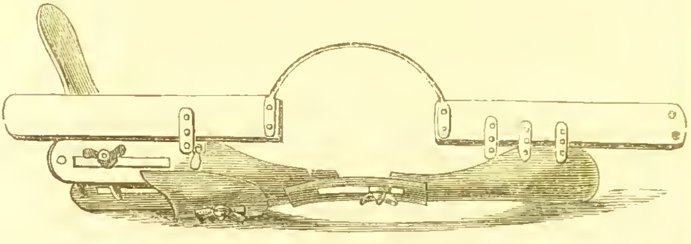
* Case of Excision, Dublin Quarterly, Nov. 1857.

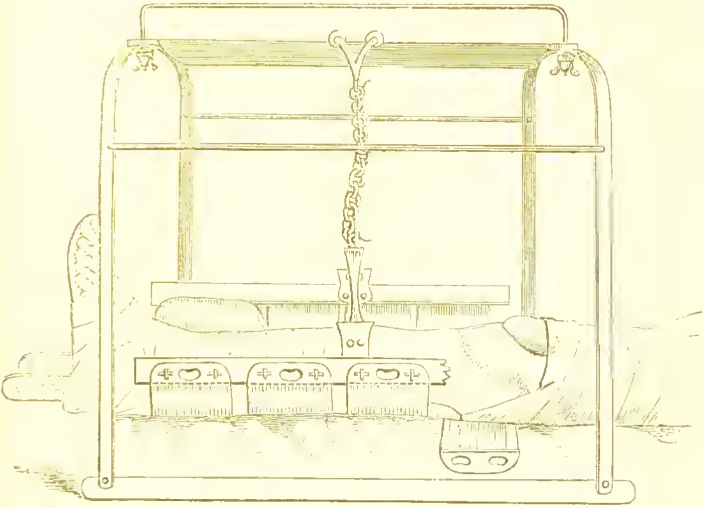
Mr. Price, who with Mr. Parkinson and Mr. Heath, had great opportunities of perfecting the details of treatment in Mr. Fergusson's cases in the King's College Hospital, before he executed his own operations, uses a McIntyre's splint, of thin tinned iron, with a footboard. The length can be regulated. The portion corresponding to the popliteal space is slightly convex upwards, so as to keep the bones in their place: and is narrow, so that the wound can be got at. There is an interval between the leg plate and footboard, in order that nothing may press on the heel or tendo Achillis. The foot and leg are confined by rollers to this splint, previously well padded with wool covered with oiled silk; and with additional pads of the same, where needed, especially behind the head of the tibia. A short splint should be laid on the front of the thigh, and compressed by a web and buckle.



Then on the outside of this apparatus is used a long side splint, the central part of which is replaced by an iron hoop. It passes up the side, and is provided with a perinæal band, as usual (p. 253). Lastly, the whole limb, so put up, may be swung in Salter's apparatus, as represented in the following drawing made from the life by Dr. Westmacott, from a patient of Mr. Price's in the Great Northern Hospital. The wounded part is uncovered, and the side splint removed, and part of the swing undone to show it. The practical fact is, that the dressings had been duly attended to, that the limb had never been disturbed since the operation, and was convalescent in the fifth week. The drawing shows a small pad placed on the femur, to keep the end of it from tilting forwards.

During the first few hours, the patient, as after every other operation, should be watched by a surgeon, to guard against shock, vomiting, spasm, and hæmorrhage. The end aimed at in the operation has been described; the time which is required to produce it is uncertain; but after five or six weeks the limb may often be lifted, and the patient go on crutches, with the firm confidence that after some months he will have a strong and useful limb, adequate for any active employment. To complain of the time required to rescue a patient from mutilation, and give him a useful leg, is absurd.

Numerical Results.—From the revival in 1850 to December 1854, 31 cases had been collected by Mr. Butcher: from that time to December 1856, when he published his second memoir, 51 additional cases; altogether 82; by the end of December 1858, Mr. Price had collected 79 besides, making 160 in all. Of the 160, 32, or 20 per cent. died; of whom eight died of pyæmia, and one of erysipelas; these are *hospital causes.* Exhaustion, irritation, and shock, destroyed 15: acute phthisis, peritonitis, pneumonia, suppression of urine, and dysentery each destroyed one; one died after amputation; two from unknown causes.



In 18 cases, one of which was fatal, amputation was obliged to be resorted to, for non-union, abscess, and hectic.

In at least 50 per cent. the operation resulted in a good useful limb.

It must be added, that during the first six months of 1859, Mr. Price has collected particulars of 24 cases; out of which four died from the operation, and six required amputation, and of these three died; whilst only 14 were cured by the operation: but it is premature to speak of the whole of them. This would increase the average mortality—taking the whole 184 cases—to 21·2 per cent. But the mortality is not equal to that of amputation of the thigh; and much of the mortality, and the necessity for amputation, depend upon causes which surgeons in time will think it a disgrace to let patients suffer from, especially hospital air.

IX. Excision of the ankle-joint and tarsus.—In disease and injury of the ankle-joint and tarsus, the surgeon should still be guided by the principles upon which he acts in disease of the wrist; namely, that diseased parts should be extirpated, and that any sound parts that may be even partially useful should be left. The operation in every case must be planned according to the state of the parts; and in most cases the surgeon will probably content himself with enlarging sinuses, denuding the diseased bones, and scooping them out piecemeal with the gouge, and repeating the operation if necessary until all the carious parts are removed, instead of removing the whole at one *coup*.

The *os calcis* has been cut out by Mr. Hancock, Mr. Gay, Mr. Page of Carlisle, and other surgeons. Mr. Page began with an incision down to the bone, from half an inch below the inner ankle, directly under the sole of the foot to the outer ankle; intending to resort to Syme's operation if the state of things revealed by future dissection should render it necessary. The flap was dissected up from the heel; the tendo Achillis cut at its insertion; the joint between the os calcis and astragalus opened, the interosseous and other ligaments divided. The incision was then carried forwards along the sole, on each side, and a flap raised from the anterior part of the os calcis, up to its articulation with the cuboid, which was then divided, and the os calcis removed.*

The *cuboid* bone may be laid bare by a crucial or H incision, and may be gouged out, or separated from its connections by forceps and knife.

The *os calcis* with the *cuboid* and *ends of the tibia and fibula* were removed by Mr. Thomas Wakley in 1847.† An incision was carried across the sole of the foot from one ankle to the other. A second and third at right angles to this along each side of the sole, so far forwards as the calcaneo-cuboid and astragalo-scaphoid joints respectively, so as to enable a flap of the sole about two inches long to be turned forwards. Then a last semicircular incision was made from one ankle to another behind the heel at the level of the insertion of the tendo Achillis, which was cut through. The flap made by this last incision was raised, and the os calcis disarticulated from the astragalus and cuboid, and removed together with the integument covering it which was included between the incisions. Then the astragalus was detached from the tibia and fibula, with great care not to wound the anterior tibial artery. The astragalus was next detached from the scaphoid, and the malleoli were removed with forceps. The posterior tibial artery was tied. The patient recovered, with a fair use of the foot.

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* Lancet, 1850, vol. i., p. 628.

† See report and drawings in Lancet, 1848, vol. ii., p. 5.; also in Guthrie's Commentaries.

APPENDIX OF FORMULÆ.

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§ 1. Tonics.

F. 1. *Cinchona with Acid.*

℞. Acidi sulphurici diluti ♏v.—xv ; syrupi aurantii fʒss ; infusi cascarillæ (*vel* decocti cinchonæ), fʒx. Misce, fiat haustus, ter die sumendus, ante cibum.

For Children.

℞. Decocti cinchonæ lancifoliæ f℥iijss. ; syrupi zinziberis f℥ss. acidi sulphurici diluti ♏xxx. Misce, sumatur pars quarta ter die.

2. *Quinine Draught with Ammonia.*

℞. Quinæ disulphatis gr. ij. ; tincturæ opii ♏ij.—v. ; spiritûs ætheris compositi, spiritûs ammoniæ aromatici āā fʒss. ; decocti cinchonæ fʒx. Misce, fiat haustus, ter vel quater die sumendus. *In cases of great Debility, with Restlessness or low Delirium.*

3. *Quinine Draughts with Acid.*

℞. Quinæ disulphatis gr. ij. ; acidi sulphurici diluti ♏v.—xv. ; tincturæ aurantii, syrupi ejusdem, āā fʒss. ; aquæ f℥jss. Misce, fiat haustus, ter die sumendus.

℞. Quinæ disulphatis gr. ij. ; acidi hydrochlorici ♏x. ; camphoræ gr. ij. ; spiritus ætheris nitrici fʒj. ; tincturæ cardamomi compositæ fʒj. ; aquæ menthæ viridis fʒx. Misce, fiat haustus, sextâ quâque horâ sumendus. *A powerful stimulant and tonic.*

4. *Liquor Cinchonæ.*

℞. Liquoris cinchonæ flavæ *Battley* ♏xx. ; aquæ pimentæ f℥j. Misce, fiat haustus quater die sumendus. *In atonic erysipelatous diseases.—A prescription of Dr. Farre's.* One fluid drachm of Battley's solution is said to be equal to an ounce of the finest bark. The Pharmacopœial *infusum cinchonæ spissatum* is probably as good.

5. *Bark with Ammonia.*

℞. Decocti cinchonæ flavæ f℥viiss. ; ammoniæ sequicarbonatis ʒss. ; syrupi zinziberis f℥ss. Misce. Dosis, pars sexta, bis vel ter die.

6. *Bark with Liquor Potassæ.*

℞. Decocti cinchonæ flavæ f℥viiss.; liquoris potassæ fʒij.; tincturæ cinchonæ compositæ fʒij. Misce. Dosis, pars sexta, bis vel ter die.

7. *Bark with Guaiacum.*

℞. Tincturæ guaiaci ammoniatæ, tincturæ humuli āā fʒss.; decocti cinchonæ lancifoliæ f℥ij. Misce, fiat haustus, ter die sumendus. *In chronic rheumatism, chronic rheumatic sclerotitis, &c.*

℞. Tincturæ guaiaci ammoniatæ, tincturæ cinchonæ compositæ singularum f℥j. Misce. Dosis, fʒij. bis die c cyatho lactis. *In chronic rheumatism or constipation with debility.*

8. *Syrupus Quinæ.*

℞. Quinæ citratis gr. iv.; syrupi simplicis fervefacti f℥j.; olei essentialis amygdalarum amarum guttas ii. Misce. Dosis, fluiddrachma bis vel ter die. *A very elegant preparation devised by the author. The flavour of the bitter almonds hides the bitter of the quinine.*

9. *Sulphate of Zinc Mixture and Pill.*

℞. Zinci sulphatis gr. vj.; acidi sulphurici diluti ♏xxx.; syrupi aurantii f℥ss.; infusi aurantii f℥vss. Misce, sumantur cochlearia duo ter die.

℞. Zinci sulphatis gr. xij.; extracti anthemidis ʒss. Misce, et divide in pilulas xij.; quarum sumatur una vel duæ ter die. *A good tonic when steel is of doubtful propriety; and in oxaluria after purgation.*

Oxyde of Zinc.

℞. Zinci oxydi, grana quatuor; ext. gentianæ, granum. Misce. fiat pilula ter die sumenda. *Dr. R. Dickson has found this remedy of great service in the profuse perspirations of phthisis.*

10. *Ammoniated Iron.*

℞. Ferri ammonio-chloridi gr. xx.; tincturæ zinziberis fʒij.; ammoniæ sesquicarbonatis ℈j.; syrupi f℥ss.; aquæ destillatæ f℥vss. Misce. Dosis, f℥j. ter die. *In debility, with acidity and flatulence.*

11. *Citrate of Iron with Ammonia.*

℞. Ferri citratis ʒss.; ammoniæ sesquicarbonatis ʒss.; tincturæ cardamomi compositæ, syrupi, singulorum fʒiii. Aquæ f℥vi. Misce. Dosis, pars sexta ter die. *In debility, with acidity and flatulence.*

Citrate of Iron for Children.

℞. Syrupi ferri citratis (*Bullock*) fluidrachmas duas; aquæ destillatæ f℥iij. Misce. Dosis, fʒss. ter die.

13. *Chalybeate Mixtures.*

R Tincturæ ferri sesquichloridi fʒij.; syrupi zinziberis ℥j.: aquæ f℥vij. Misce. Sumantur cochlearia duo magna bis die.

℞. Liquoris ferri acetatis (*Pharm. Dub.*) fluidrachmam; aquæ pimentæ fluiduncias sex. Sumat æger partem sextam ter die.

14. *Steel and Acid Mixture.*

℞. Ferri sulphatis gr. xij.; acidi sulphurici diluti fʒj.; tincturæ cardamomi compositæ f℥ss.; infusi rosæ compositi f℥vss. Misce, sumantur cochlearia duo magna bis vel ter die.

15. *Steel, Ammonia, and Quassia.*

℞. Infusi quassiæ f℥ss.; tincturæ ferri ammoniati fʒss.; ammoniæ sesquicarbonatis gr. vj.; syrupi aurantii fʒj.; aquæ destillatæ fʒvij. Misce, fiat haustus, bis vel ter quotidie sumendus. *For hysterical women.* (*Brodie.*)

16. *Sulphate of Iron for Children.*

℞. Ferri sulphatis gr. iii.; acidi sulphurici diluti ♏xij; syrupi zinziberis fʒiij.; aquæ florum aurantii fʒiij.; aquæ destillatæ f℥ijss. Misce. Dosis, f℥ss. ter die.

17. *Syrup of Iodide of Iron* (*Pharm. Lond.*)

℞. Syrupi ferri iodidi f℥j.; sumat æger guttas xx.—xl., bis die, e cyatho aquæ, vel infusi zinziberis.

Iodide of Iron, with Sarsaparilla.

℞. Syrupi ferri iodidi, syrupi sarsæ āā f℥j. Misce. Sumat æger cochleare parvum bis quotidie ex aqua. (*Dr. Ferguson.*)

18. *Mistura Ferri Aromatica, or Heberden's Ink.*

℞. Corticis cinchonæ lancifoliæ contusi ℥j.; caryophyllorum contusorum ʒij.; ferri ramentorum ℥ss.; aquæ menthæ piperitæ f℥xv.; macera per dies tres in vase clauso, subinde agitans, dein cola, et adde tincturæ cardamomi compositæ f℥iij.; tincturæ aurantii fʒiij. Dosis, f℥j.—iij. bis vel ter die. *A most agreeable aromatic tonic. The Dublin Pharmacopœia, from which this formula is taken, orders* ʒiij. *of sliced calumba root with the bark: but the preparation is less nauseous without it.*

19. *Griffith's Mixture.*

℞. Myrrhæ contritæ ʒj.; potassæ carbonatis ʒss.; aquæ f℥vss.; ferri sulphatis gr. xii.; spiritus myristicæ f℥ss.; sacchari ʒiv. First dissolve the sulphate in two ounces of water, and put it into the bottle; then rub the other ingredients smoothly together, and add them. Dose, f℥j.—iss. thrice daily. *The original prescription is to be seen in Dr. Moses Griffith's Practical Treatise on Hectic Fevers and Pulmonary Consumption, written at Colchester,* 1776. *New Ed. Lond.* 1795. *Dr. Griffith frequently varied the proportion of the ingredients, and sometimes added tincture of bark, nitre, &c.*

20. *Steel with Aloes.*

℞. Misturæ ferri compositæ, decocti aloes compositi partes equales. Dosis, f℥j. ter die. *In chlorosis, constipation with debility, &c.*

℞. Extracti aloes purificati gr. vj.; ferri sulphatis gr. xij.; extracti glycyrrhizæ gr. xij. Misce et divide in pilulas xij.; quarum sumatur una bis die, ante cibum.

21. *Nux Vomica and Strychnia.*

℞. Tincturæ nucis vomicæ (*Pharm. Dub.*) fʒi.; acidi nitromuriatici diluti fʒij.; tincturæ zinziberis fʒij.; syrupi fʒiij.; aquæ f℥vss. Misce. Dosis, pars sexta ter die. *In any form of functional paralysis after all known causes are remedied. In obstinate debility, diabetes insipidus, alkaline urine, &c.*

℞. Extracti nucis vomicæ gr. ij.; mannæ ℈j. Misce et divide in pilulas viij.; quarum sumatur una ter die. *The extract such as is prepared by Squire is quite as efficacious a medicine as strychnia itself, and very much safer. Any mistake in dispensing strychnia might be fatal. The dose may be increased by degrees.*

22. *Dilute Nitromuriatic Acid.*

℞. Acidi nitrici fortissimi fʒj.; acidi hydrochlorici fʒij. Misce et adde, aquæ destillatæ fʒxv. Dosis, ♏x—xxx. ex aqua.

℞. Acidi nitromuriatici diluti fʒij.; spiritus ætheris nitrici fʒij.; syrupi f℥ss.; aquæ f℥vijss. Misce. Sumatur pars sexta ter die. *In dyspepsia, with nasty tongue and inactive liver.*

(*With a dose of this it is often useful to give a pill containing a grain of sulphate of zinc with a little bitter extract, and in other cases a drachm of liquor taraxaci.*)

℞. Acidi nitromuriatici diluti fʒij.; infusi chirettæ f℥vijss. Misce. f℥iss. ter die. *A bitter that is very grateful to irritable bowels.*

23. *Nitric Acid Mixture to relieve Thirst.*

℞. Potassæ nitratis ʒj.; acidi nitrici diluti fʒij.; syrupi fʒij.; aquæ puræ Oij.; Misce. Dosis, f℥iv. pro re natâ. *Mr. Cole.*

Dilute Nitromuriatic Acid with Orange Peel.

℞. Acidi nitrici diluti, acidi muriatici diluti aa fʒjss.; syrupi aurantii f℥j.; aquæ florum aurantii f℥j.; aquæ destillatæ f℥xiijss. Misce; sumatur cyathus vinarius ter vel quater die. (*Brodie.*)

24. *Sulphuric Acid Mixture.*

℞. Acidi sulphurici diluti fʒij.; syrupi aurantii fʒvj.; aquæ f℥vijss. Misce. Sumatur pars sexta ter die. *A grateful refrigerant and tonic in debility with profuse perspiration, in hot weather, &c.*

25. *Sulphuric Acid and Æther, or Sutton's Punch.*

℞. Acidi sulphurici diluti ♏xl.; spiritûs ætheris sulphurici compositi fʒij.; sacchari albi ʒss.; aquæ menthæ viridis f℥vj. Misce. Sumatur pars quarta, quater die. *An admirable restorative after illness.*

26. *Stimulating Mixtures.*

℞. Ætheris chlorici fʒj.; pulveris acaciæ ʒss.; aquæ f℥iv. Misce. Dosis, pars tertia subinde.

℞. Olei cajuputi (vel olei rutæ) ♏x.; pulveris acaciæ ʒss.; syrupi fʒij.; tincturæ lavandulæ compositæ fʒij.; aquæ f℥iijss. Misce. Dosis, pars tertia subinde.

℞. Spiritus ammoniæ aromatici fʒiss; spiritus ætheris sulphurici fʒj.; syrupi zinziberis fʒij.; aquæ anethi f℥iijss. Misce. Dosis, pars tertia, subinde. *In syncope, hysteria, tympanites, &c.*

27. *Mistura quatuor Aromatum Vinosa, vulgo, Negus.*

℞. Cinnamomi, zinziberis, myristicæ, caryophillorum singulorum contusorum ℈j.; sacchari albi ℥j.; vini Hispanici, vel Lusitanici generosi, aquæ ferventis āā f℥vj. Calefac simul in vase idoneo, super ignem, donec ebullitio incipisse videbitur, dein cola. Dosis, f℥ij. *In syncope, sinking, rigors, &c.*

White Wine Whey.

℞. Vini Xerici (vulgo *Sherry*), vel vini ex Insulis Fortunatis devecti (vulgo *Madeira*), cyathum vinarium; lactis recentis fervefacti octarium dimidium; coque simul donec caseum lactis coierit, dein cola per linteum.

Egg Wine.

℞. Ovi recentis vitellum; conquassa bene cum cochleari uno aquæ frigidæ. His infunde paulatim Vini Xerici cyathum, cum parte æquali aquæ mistum et fervefactum. Adjice myristicæ pauxillum.

A Nightcap.

Dissolve a quarter of an ounce of isinglass and two lumps of sugar in a small tumbler of boiling water. Add half a glass of brandy, or

a glass of sherry, or two glasses of claret, and a bit of nutmeg or cinnamon. *A capital thing for a patient who is afraid of cholera.*

28. *Strong Camphor Mixture.*

℞. Camphoræ gr. xxv.; amygdalas dulces decorticatas sex; sacchari purificati ʒiij.; optime contere dein adde gradatim, aquæ menthæ viridis f℥vijss.; ut fiat mistura, cujus sumantur cochlearia tria magna quartâ quâque horâ. (*Hooper.*) *In hysteric, and various nervous and spasmodic affections.*

29. *Indian Hemp.*

℞. Extracti cannabis Indicæ (*Squire*) gr. iii.; mannæ grana duodecim. Misce, et divide in pilulas duodecim. *Doses, one, two, or more. An uncertain, but very often efficacious narcotic in tetanus, neuralgia, and other painful maladies.*

30. *Compound Soothing Pills.*

℞. Pulveris ipecacuanhæ compositi, extracti conii, singulorum ʒj.; misce et divide in pilulas xxiv.; quarum sumantur una vel duæ subinde. *In painful ulcers, chronic rheumatism, stricture, &c.* (*C. Mayo.*)

℞. Extracti hyoscyami, extracti conii, extracti papaveris, singulorum ℈j. Misce et divide in pilulas xij. *In similar cases.*

31. *Pulvis Sudorificus Salinus.*

℞. Pulveris ipecacuanhæ compositi grana quindecim; potassæ nitratis grana quindecim; potassæ bicarbonatis grana quinque. Misce, fiat pulvis, horâ somni sumendus, è cyatho ptisanæ.*

32. *Compound Opiate Mixtures.*

℞. Liquoris opii sedativi ♏xx.; spiritus ammoniæ aromatici, spiritus ætheris nitrici, singulorum fʒiss.; syrupi fʒij.; misturæ camphoræ f℥vss. Misce. Dosis, pars quarta, quartis horis.

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* We offer this as a substitute for the original *Pulvis Doveri*, the recipe for which is as follows:—"Take opium an ounce, saltpetre and tartar vitriolated each four ounces, ipecacuanha one ounce, liquorice one ounce. Put the saltpetre and tartar into a red-hot mortar, stirring them with a spoon till they have done flaming: then powder them very fine; then slice in your opium, grind these to a powder, and mix the other powders with these. Dose from 40 to 60 or 70 grains in a glass of white wine posset, going to bed; covering up warm, and drinking a quart or three pints of the posset-drink while sweating." Dr. Dover accounts for the largeness of the dose by saying, that the properties of the opium are mitigated by the other ingredients; but in the present day, four, six, or seven grains of opium would be a dangerous dose, spite of the other ingredients. But if this is a true copy of the recipe, it is very difficult to understand how the saltpetre and vitriolated tartar can *flame* when heated together. Possibly the cream of tartar was used, and not the sulphate of potass.—See "The Ancient Physician's Legacy to his Country," by Thomas Dover, M.B. Fifth edition. 1733.

℞. Morphiæ hydrochloratis granum; acidi hydrochlorici diluti guttas duas; aquæ f℥viiss.; syrupi zinziberis f℥ss. Misce. Dosis, pars octava.

℞. Syrupi papaveris fʒiv.; magnesiæ carbonatis ʒſs.; spiritus ætheris nitrici; tincturæ hyoscyami, singulorum fʒij.; misturæ camphoræ f℥vij.; Misce. Dosis, pars sexta subinde. *To tranquillize the system after injuries, operations, accouchements, hæmorrhage, violent mental excitement, &c.* (*Dr. Gooch.*)

Mr. Cole's Stimulating Narcotic Draught for Delirium Tremens.

℞. Extracti opii (Hill) gr. ij, vel iij; aquæ ferventis f℥iv.; tere in mortario et adde *brandy* f℥iss.; sacchari q. s. Misce. *The patient should be allowed to sip this out of a tumbler, like a glass of grog.* Cole's Mil. Surg., p. 59.

§ II. APERIENTS.

33. *Calomel.*

℞. Calomelanos, grana quinque; antimonii tartarizati grani $\frac{1}{6}$; fiat pilula.

℞. Calomelanos grana quatuor; extracti colocynthidi compositi grana sex; fiant pilulæ duæ.

34. *Black Draught.*

℞. Sennæ foliorum ʒvj.; zinziberis concisi ʒss.; extracti glycyrrhizæ ʒij.; potassæ carbonatis ʒss.; aquæ ferventis f℥ix. Post horas tres cola, et adde spiritûs ammoniæ aromatici fʒij.; magnesiæ sulphatis ℥j; (vel potassæ tartratis ℥j) tincturæ sennæ, tincturæ cardamomi compositæ āā f℥ss. Dosis f℥jss.*

Red Draught.

℞. Magnesiæ sulphatis ʒij—iv.; syrupi zinziberis, tincturæ cardamomi compositæ, singulorum fʒj.; infusi rosæ compositi f℥x. Misce.

35. *Haustus Magnesiæ Sulphatis Acidus.*

℞. Magnesiæ sulphatis ʒj.—ʒiv.; syrupi aurantii fʒij.; acidi sulphurici diluti ♏x.; aquæ f℥j. Misce, fiat haustus. *To this draught may be added one grain of sulphate of zinc, or of sulphate of iron, or two grains of quinine, in cases of debility.*

36. *Haustus Magnesiæ Albus.*

℞. Magnesiæ sulphatis ʒij.; magnesiæ carbonatis ℈j.; syrupi zinziberis fʒj.; aquæ menthæ viridis f℥xj. Misce, fiat haustus. *This draught will often be retained by the stomach when almost every other is rejected.*

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* This draught is greatly improved, both in flavour and efficacy, by the addition of a few carraway seeds, one ounce of buckthorn juice, one of tincture of jalap, and six of moist sugar.

37. *Cordial Aperient Draught.*

℞. Tincturæ sennæ f℥ss.; tincturæ rhei f℥ss. Misce.

38. *Rhubarb Draughts and Powders.*

℞. Pulveris rhei, semiscrupulum; sodæ bicarbonatis, scrupulum; sacchari albi, scrupulum; olei lavandulæ guttas quinque. Misce, fiat pulvis, e cochlearibus duobus aquæ sumendus. *This is the most perfect combination of rhubarb. The lavender hides its flavour completely.*

℞. Pulveris rhei, bismuthi trisnitratis, confectionis aromaticæ, āā ℈ij.; aquæ menthæ piperitæ f℥iv. Misce. Sumatur pars quarta bis die. *In habitual constipation and flatulence.*

℞. Rhei gr. xv.; magnesiæ carbonatis ℈ss.; spiritus ammoniæ aromatici fʒss.; syrupi fʒj.; aquæ anethi fʒx. Misce. *For cases of colic, diarrhœa, with acidity and indigestion, &c.*

Rhubarb and Polychrest Salt. (Dr. William Fordyce.)

℞. Pulveris rhei, potassæ sulphatis āā ℥j.; pulveris zinziberis ʒj. Misce. Dosis gr. x.—xl. *A capital aperient for children; serving, in most cases, all the purposes of mercury.*

℞. Rhei, potassæ sulphatis āā ℈j.; spiritus lavandulæ compositi fʒj.; aquæ f℥j. Misce, fiat haustus. *A warm efficient purgative.*

39. *Saline Aperient Draughts.*

℞. Sodæ potassio-tartratis ʒiv.; succi limonum fʒii.; syrupi zinziberis fʒj.; spiritûs myristicæ f℥ss.; aquæ f℥ij. Misce, fiat haustus. *A cooling purgative.*

℞. Sodæ potassio-tartratis ʒij. sodæ sesquicarbonatis ℈j.; sacchari albi ʒj.; fiat pulvis, e cyatho aquæ sumendus, cum cochleari magno succi limonis, vel cum acidi citrici granis quindecim.

40. *Epsom Salts and Tartar Emetic.*

℞. Magnesiæ sulphatis ℥j.; antimonii tartarizati gr. j.; aquæ menthæ f℥x. Misce; sumantur cochlearia magna tria, quartâ quâque horâ. *An active nauseating aperient, fit for robust persons threatened with acute inflammation. (Sir A. Cooper.)*

41. *Saline Aperients with Tonics.*

℞. Magnesiæ sulphatis ʒiv.; ferri sulphatis gr. viii.; quinæ disulphatis gr. xii. acidi sulphurici diluti fʒjss.; syrupi zinziberis fʒj.; tincturæ ejusdem fʒij.; aquæ f℥viij. Misce. Dosis, pars octava bis die.

℞. Magnesiæ sulphatis ʒj.; acidi sulphurici diluti fʒj.; ferri sulphatis gr. xv.; infusi gentianæ compositæ f℥iij.; tincturæ aurantii fʒiv.: infusi rosæ f℥vj. Misce. Dosis pars sexta bis quotidie.

℞. Ferri potassio-tartratis ʒij.; sodæ potassio-tartratis ℥vj. Misce; fiant pulveres sex. Sumatur una mane, ex cyatho aquæ. *Combinations of saline purgatives with tonics, so as to answer the double purpose of draining congested abdominal veins, and bracing the system, are of great efficacy in most chronic complaints. The second of these formulæ is a prescription of Dr. Jephson's, who is famous for such combinations.*

42. *Pulvis e quatuor Salibus.*

℞. Sodii chloridi, sodæ sulphatis, magnesiæ sulphatis, potassæ sulphatis, singulorum partes æquales. Optime misceantur, et desiccentur ante ignum. Dosis ʒj.—iv., ex cyatho aquæ. *An agreeable saline aperient. A grain of sulphate of iron may be added to each dose, with sugar or ginger, if agreeable.*

43. *Hospital House Physic.*

℞. Magnesiæ sulphatis ℥ij.; pulveris rhei, jalapæ āā ʒj.; aquæ menthæ piperitæ f℥vij. Misce. Dosis, pars sexta.

45. *Castor Oil and Turpentine Draught.*

℞. Olei terebinthinæ, olei ricini āā fʒvj.; mucilaginis acaciæ f℥ij.; aquæ menthæ quantum satis sit ut fiat haustus.

46. *Aperient Electuaries.*

℞. Pulveris potassæ supertartratis ℥ss.; sulphuris præcipitati ʒij.—iv.; confectionis sennæ ℥j.; syrupi zinziberis, quantum satis sit.

℞. Magnesiæ ustæ, potassæ supertartratis, pulveris rhei, āā ʒj.; pulveris zinziberis ʒss; theriacæ, quantum satis est.

℞. Mannæ, confectionis sennæ, āā ℥j.; sulphuris ʒiij.; syrupi quantum satis sit. Dosis ʒj.—iv., omni nocte horâ somni.

47. *Pilulæ Catharticæ.*

℞. Aloes ℥ss.; pulveris colocynthidis, cambogiæ āā ʒj.; jalapæ ʒij.; saponis ʒj.: antimonii tartarizati ℈ss; olei caryophillorum ♏xx.; contunde simul, et divide in pilulas, pondere granorum quinque.

48. *Pilulæ Catharticæ cum Calomelane.*

℞. Pilulæ præcedentis ʒiv.; calomelanos ʒj. Misce et divide in pilulas lx.

Pilulæ Hypercatharticæ.

℞. Extracti colocynthidis compositi ℈ij; olei crotonis guttas duas.—Divide in pilulas octo, quarum sumantur duæ. *For threatened apoplexy, œdema glottidis, &c.*

49. *Blue Pill and Colocynth.*

℞. Pilulæ hydrargyri ℈ss.; extracti colocynthidis compositi ℈ijss. Misce, fiant pilulæ duodecim.

50. *Sulphate of Iron with Aloes.*

℞. Ferri sulphatis, aloes Barbadensis āā ʒij.; pulveris rhei ʒj. Misce et divide in pilulas lx. Dosis, una vel duæ horâ somni. *An admirable aperient for weak constipated persons.*

51. *Pilulæ Aloes Dilutæ.*

℞. Extracti aquosi aloes Barbadensis, saponis, theriacæ, extracti glycyrrhizæ āā ʒj. Solve leni calore in balneo; dein divide in pilulas xlviij. Dosis, una horâ somni. *A capital eccoprotic aperient, unloading the colon of scybala, but rather irritating to the rectum. The aloes should be of the best Barbadoes kind, purified by solution in water. The formula is attributed to Dr. Marshall Hall.*

52. *Ipecacuanha and Rhubarb Pills.*

℞. Pulveris ipecacuanhæ gr. xxiv.; pulveris rhei ℈iv.; saponis ℈ss. Misce et divide in pilulas xxiv.; quarum sumatur una ter die. *A gentle aperient in piles and other congested conditions of the intestines.*

℞. Ipecacuanhæ gr. vj.; extracti aloes purificati gr. vj.; extracti rhei gr. xxxvj.; olei cajuputi ♏iv. Misce et divide in pilulas xij.; sumatur una, horâ ante prandium. *A good dinner pill for constipated persons.*

53. *Pills of Aloes and Sulphuric Acid.*

℞. Aloes Barbadensis gr. xxiv.; acidi sulphurici fortissimi guttas vj. Misce et divide in pilulas vj.; quarum sumantur duo, quartâ quâque horâ. *A very powerful aperient, that often succeeds when almost everything else fails. The author is indebted for the prescription to his friend Dr. Dickson.*

54. *Guaiacum and Jalap Pills.*

℞. Guaiaci pulveris, extracti jalapæ, extracti hyoscyami, āā ℈j.; cambogiæ gr. iij. Misce et divide in pilulas duodecim; quarum sumantur una vel duæ horâ somni. *An active purge, not irritating to the rectum.*

55. *Gingerbread Electuary.*

℞. Guaiaci pulveris ʒij.; sulphuris, rhei, āā ʒj.; zinziberis ʒj.; *Treacle* quantum satis sit ut fiat electuarium. Dosis, pars sexta.

56. *Guaiacum Electuaries.*

℞. Pulveris guaiaci gr. v.; pulveris cinchonæ ℈j.; pulveris cinnamomi compositi ℈ss. Misce, fiat pulvis bis die sumendus.

℞. Pulveris guaiaci ʒij.; pulveris rhei ʒss.; sulphuris ʒi.; pulveris myristicæ ʒss.; theriacæ quantum satis est ut fiat electuarium. Dosis, pars sexta omni nocte. *In chronic rheumatic diseases. This is commonly called the Chelsea Pensioner.*

57. *Sulphate of Manganese.*

R. Manganesii sulphatis ℈j.; magnesiæ sulphatis ʒij.; syrupi zinziberis fʒj.; aquæ f℥jss. Misce fiat haustus mane sumendus. *In gouty cases, to produce a copious discharge of bile.*

℞ Manganesii sulphatis, pulveris rhei āā ℈j.; spiritus lavandulæ compositi fʒj.; aquæ f℥iss. Misce fiat haustus.

§ III. ALTERATIVE AND FEBRIFUGE MEDICINES.

58. *Saline Draughts.*

℞. Potassæ nitratis ℈ij.; sodæ sesquicarbonatis ℈j.; syrupi croci, spiritûs ætheris nitrici āā fʒj.; aquæ f℥v. Misce. Dosis f℥jss. quartâ quâque horâ.

℞. Potassæ nitratis gr. x.; sacchari ℈j. Misce, fiat pulvis, sumendus e cyatho vinario aquæ menthæ viridis. *Green mint water and nitre form a very agreeable mixture, and produce a pungent cooling sensation on the tongue and palate. But the salt should only be dissolved at the moment of administration, and the mint water should be quite cool. Attention to these trifles makes a great difference to a patient who is parched with fever.*

℞. Potassæ bicarbonatis ℈iv.; syrupi zinziberis fʒij.; aquæ f℥vss. Dosis f℥jss. quartâ quâque horâ, cum fʒss. succi limonum recentis.

℞. Liquoris ammoniæ acetatis f℥ij.; spiritûs ætheris nitrici fʒss; misturæ camphoræ fluiduncias quinque cum semisse. Misce. Dosis, pars quarta, quartâ quâque horâ.

℞. Ammoniæ sesquicarbonatis ℈ijss.; tincturæ cardamomi compositæ f℥ss.; aquæ f℥v. Misce. Dosis f℥jss. quartâ quâque horâ, cum cochleari magno succi limonum, vel gr. xv. acidi citrici. *In the early stage of erysipelas, and low fevers.*

59. *Digitalis Draught, for Aneurysm.*

℞. Tinct. digitalis ♏xv.; aceti destillati fʒj.; syrupi fʒj; aquæ f℥jss. Misce; fiat haustus ter die sumendus, ad duodecim vices.

60. *Borax.*

℞. Sodæ biboratis ʒj.; sodæ sesquicarbonatis ʒss.; potassæ nitratis ʒss. Misce et divide in pulveres sex; quorum sumatur unus ter die e cyatho aquæ. *In lithic deposits.*

61. *Phosphate of Soda.*

℞. Sodæ phosphatis ʒiij. Fiat pulvis, mane sumendus e cyatho aquæ. *As an aperient when the urine is red.*

℞. Sodæ phosphatis ℈j.; infusi gentianæ compositi f℥j. Misce, fiat haustus bis die sumendus.

62. *Calomel and Opium Pill.*

℞. Calomelanos gr. i.—ii.; pulveris opii gr. $\frac{1}{4}$—$\frac{1}{2}$; extracti glycyrrhizæ quantum sufficit ut fiat pilula, quartis—sextis horis sumenda. *To mercurialize the system in acute inflammation.*

Calomel and Opium, with Antimony.

℞. Calomelanos i.—ii.; pulveris opii gr. $\frac{1}{4}$—$\frac{1}{2}$; antimonii tartarizati gr. $\frac{1}{6}$; extracti glycyrrhizæ quantum satis sit ut fiat pilula. *This formula may be used when there is a considerable amount of sthenic inflammation.*

63. *Alterative Pill.*

℞. Pilulæ hydrargyri, granum dimidium; extracti hyoscyami gr. ij. Misce, fiant pilula bis vel ter die sumenda.

64. *Alterative Powders.*

℞. Hydrargyri cum creta gr. iij.—vi.; pulveris Doveri gr. j.—v. Sodæ sesquicarbonatis, sacchari albi āā ℈j. Misce, fiat pulvis omni nocte sumendus.

℞. Hydrargyri cum creta gr. ij.; pulveris rhei gr. v.; sacchari ℈ss.; pulveris cinnamomi gr. v. Misce, fiat pulvis, omni nocte sumendus. *As a gentle alterative in chronic diseases, when the secretion of bile and urine is scanty.*

65. *Calomel and Colchicum.*

℞. Calomelanos gr. iv.; extracti colchici acetici gr. xij.; extracti colocynthidis compositi gr. xxiv.; extracti hyoscyami gr. xxiv. Misce, fiant pilulæ duodecim, quarum sumat unam vel duas horâ somni. *In rheumatic and gouty inflammations.*

66. *Plummer's Pill.*

℞. Sulphurati aurati antimonii, calomel āā ʒij.; tere simul donec bene misceantur, dein adde pulveris resinæ guaiaci ʒiv.;* balsami copaibæ q. s. ut fiat massa pilularis ex cujus singulis drachmis formentur pilulæ xij. *Abridged from Dr. Andrew Plummer's original paper in the "Medical Essays and Observations published by a Society in Edinburgh," vol. i., 1747. Dr. Plummer was Professor of Medicine in the University of Edinburgh at that time.*

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* In the original, gummi guaiaci ʒiij.; resinæ guaiaci ʒj.

67. *Tartar Emetic with Mercury.*

℞. Antimonii potassio-tartratis gr. j.; hydrargyri cum creta gr. viij.; extracti conii gr. xvj. Misce et divide in pilulas octo; quarum sumatur una bis vel ter die.

68. *Tartar Emetic.*

℞. Antimonii tartarizati, granum; aquæ destillatæ, fluidunciam. Sumatur cochlcare parvum quarta quaque horâ.

℞. Antimonii potassio-tartratis gr. j.—ij.; syrupi papaveris f℥ss. aquæ destillatæ f℥vijss. Misce; sumantur cochlearia duo magna ter die.*

℞. Antimonii potassio-tartratis gr. iij.; tincturæ opii fʒss.; aquæ f℥vj. Misce. Dosis, cochleare unum omni semihorâ, vel majori intervallo donec delirium cessaverit. *In delirium tremens and other cases of nervous excitement in which depletion is inadmissible.—See Dr. Graves's Clinical Medicine.*

69. *Colchicum Draughts.*

℞. Vini radicis colchici fʒss.; syrupi fʒss.; aquæ f℥i. Misce, fiat haustus quartis—sextis horis sumendus.

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* The inventor of the contrastimulant method of administering tartar emetic was Thomas Marryat, born 1730, died 1792; practised at Bristol; a very eccentric person: author of "Therapeutics, or the Art of Healing," a work which passed through many editions, and was very popular with apothecaries at the beginning of the present century. The twenty-fourth edition was published in 1816 by Sherwood. The author says, page 5, "any fever may soon be extinguished by the use of the following powders:—Take of tartarized antimony five grains; white sugar or nitre a drachm. Let them be well rubbed in a glass mortar, and be divided into six powders; one to be taken every three hours, notwithstanding the nausea the first may probably occasion. If they bring on a diarrhœa they should still be continued, and it will soon cease. If these are taken (which is most commonly the case) without any manifest inconvenience, let there be seven grains in the next six powders, and in the next, ten. Here I beg leave to retract what I said in some former editions of this work: viz., that till sickness and vomiting was excited, this noble medicine was not to be depended on. For I have seen many instances wherein a paper has been given every three hours (of which there have been ten grains in six powders), without the least sensible operation, either by sickness, stool, urine, or sweat, and though the patients had been unremittingly delirious for more than a week with subsultus tendinum, and all the other appearances of hastening death, they have perfectly recovered without any other medical aid, a clyster every other day excepted."

70. *Colchicum and Magnesia.*

℞. Vini colchici fʒij.; solutionis magnesiæ* f℥jss.; syrupi croci fʒij.; misturæ camphoræ f℥ivss. Misce; sumantur cochlearia duo quartâ quâque horâ.

℞. Magnesiæ carbonatis, sodæ sesquicarbonatis āā ℈ss.; vini seminum colchici ♏xv.; aquæ pimentæ f℥jss. Misce, fiat haustus ter die sumendus.

71. *White Purgative Draught with Colchicum.*

℞. Aceti colchici fʒj.; magnesiæ sulphatis ʒij.; magnesiæ carbonatis ℈j.; syrupi zinziberis fʒj.; aquæ anethi fʒx. Misce. (*Sir C. Scudamore.*)

72. *Antilithic Pill.*

℞. Extracti colchici acetici, hydrargyri cum creta āā gr. j.; extracti colocynthidis compositi gr. ij. Misce fiat pilula omni nocte sumenda.

Sir. A. Cooper's Prescription for Chronic Gout and Rheumatism.

℞. Potassæ bicarbonatis ʒss.; tincturæ aurantii fʒij.; decocti aloes compositi f℥viij. Misce; sumatur cyathus vinarius omni mane.

73. *Colchicum and Rhubarb.*

℞. Infusi rhei fʒx.; vini colchici ♏xx.; potassæ bicarbonatis ℈j.; tincturæ cardamomi compositæ fʒj. Misce, fiat haustus horâ somni sumendus. *Dr. Marshall Hall.*

74. *Turpentine in small Alterative Doses.*

℞. Mucilaginis f℥ss.; sodæ sesquicarbonatis ℈ss.; olei terebinthinæ ♏xv.—xl.; aquæ destillatæ f℥j. Misce, fiat haustus. *In rheumatism, rheumatic ophthalmia, iritis, passive hæmorrhage, &c.*

75. *Lead Draught.*

℞. Plumbi acetatis gr. iij. aceti destillati fʒij.; tinct. opii ♏j.—x.; syrupi rhæados fʒj.; aquæ destillatæ fʒvij. Misce; fiat haustus quartâ quâque horâ sumendus, ad sex vices. *In active hæmorrhage.*

76. *Tonic Aperient and Antacid Powders.*

℞. Sodæ carbonatis exsiccatæ gr. v.; pulveris calumbæ gr. x.; pulveris rhei, zinziberis āā gr. ij. Misce; fiat pulvis, quotidie ante prandium sumendus.

℞. Ferri sesquioxydi ℈j.; sodæ bicarbonatis gr. iij.; pulveris rhei gr. iij. Misce, fiat pulvis, ter die sumendus.

℞. Pulveris cinchonæ ℈j.; sodæ bicarbonatis gr. iij.; pulveris aromatici gr. v. Misce, fiat pulvis, ter die sumendus.

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* Made by Murray or Dinneford.

77. *Antacid and Carminative Mixtures.*

℞. Magnesiæ carbonatis ℈i.; spiritûs ammoniæ aromatici fʒss.; syrupi aurantii fʒiij.; aquæ calcis, aquæ destillatæ āā f℥iij. Misce, sumantur cochlearia duo magna ter die. *After meals.*

℞. Cretæ preparatæ ʒss.; liquoris calcis f℥iij.; aquæ anethi f℥iij. Misce, sumantur cochlearia duo magna ter die.

℞. Potassæ bicarbonatis ℈j.; infusi rhei f℥ij.; syrupi zinziberis fʒij.; aquæ menthæ piperitæ f℥ij. Misce. Dosis fʒj. bis die.

The above prescriptions are intended for children with voracious appetites, red tongues, thirst, and loaded urine.

℞. Infusi caryophylorum f℥viijss.; sodæ bicarbonatis ʒj.; spiritûs ammoniæ aromatici fʒij.; tincturæ cardamomi compositæ f℥ss. Misce. Dosis f℥jss. bis die.

℞. Ammoniæ sesquicarbonatis, potassæ bicarbonatis āā ʒss.; aquæ destillatæ f℥vijss. Dosis f℥jss. bis die. *For adults labouring under dyspepsia, acidity, and turbid urine. To be taken after breakfast and at bed-time.*

78. *Liquor Potassæ Mixtures.*

℞. Liquoris potassæ fʒiij.; syrupi fʒiij.; aquæ destillatæ f℥vij. Misce. Sumatur pars sexta ter die, post cibum.

℞. Liquoris potassæ; tincturæ gentianæ; syrupi zinziberis, spiritus ætheris nitrici āā fʒiij.; aquæ destillatæ f℥viss. Misce; sumatur pars sexta bis vel ter die, post cibum.

79. *Bismuth.*

℞. Bismuthi trisnitratis, drachmam; pulveris acaciæ ʒij.; potassæ bicarbonatis ʒii.; misturæ camphoræ fluiduncias sex. Misce. Dosis f℥jss. bis die. *To be taken an hour after breakfast and dinner in cases of gastrodynia and pyrosis. To this mixture ten minims of Scheele's prussic acid may be added if there is much pain.*

℞. Bismuthi trisnitratis ʒj.; magnesiæ carbonatis ʒss.; pulveris acaciæ ʒij.; aquæ f℥vi. Misce. Dosis f℥jss. bis die.

Pulvis Bismuthi Compositus.

℞. Bismuthi trisnitratis, pulveris acaciæ, sodæ bicarbonatis, singulorum ℈j.; pulveris zinziberis gr. v. Misce, fiat pulvis hora post cibum sumendus, ter die. *In all cases of irritable or chronic inflammation, attended with acidity, flatulence, and irritable stomach, these combinations of bismuth and alkali are most valuable.*

80. *Prussic Acid Mixtures.*

℞. Acidi hydrocyanici diluti (*Pharm. Lond.*) ♏iv.; potassæ bicarbonatis gr. x.; syrupi zinziberis fʒss.; aquæ anethi f℥iss. Misce, fiat haustus bis die sumendus. *In cases of irritable acid stomach.*

℞. Acidi hydrocyanici diluti (*Pharm. Lond.*) ♏iv.; misturæ cretæ f℥iss.; sodæ bicarbonatis gr. v. Misce, fiat haustus. *In the same class of cases, with irritable bowels.*

81. *Antilithic Powder.*

℞. Magnesiæ gr. vj.; potassæ bicarbonatis gr. xij.; potassæ tartratis gr. xv. Misce; fiat pulvis, omni vespere sumendus e cyatho parvo aquæ. (*Brodie.*)

82. *Sarsaparilla and Nitric Acid.*

℞. Decocti sarsæ compositi f℥iv.; acidi nitrici diluti ♏xx.—x.; tincturæ hyoscyami fʒss. Misce, fiat haustus ter die sumendus.

83. *Alkaline Infusion of Sarsaparilla.*

℞. Sarsaparillæ Jamaicensis radicis, concisæ et contusæ ℥ij.; radicis glycyrrhizæ concisæ ʒij.; liquoris potassæ ♏xl.—lx.; aquæ destillatæ ferventis f℥x.; tincturæ cardamomi compositæ f℥iij. Macera per horas viginti quatuor, et cola. Sumatur totum quotidie.

Sarsaparilla with Iodide of Potassium.

℞. Potassii iodidi gr. xl.; extracti sarsæ liquidi f℥ii.; solve. Dosis ʒii. bis die, ex aquæ.

84. *Sarsaparilla and Lime Water.*

℞. Sarsaparillæ ℥ij.; glycyrrhizæ ʒij.; liquoris calcis f℥x. Macera per horas viginti quatuor, et cola. Sumatur totum indies.

85. *Sarsaparilla Soup.*

To three ounces of sarsaparilla, sliced, add three pints of water; let them simmer on a slow fire until reduced to two pints; take out the root, bruise it, and return it into the water with half a chicken, or half a pound of beef without fat; boil them for an hour slowly, and pour off the soup for use.—*Dr. Colles's Lectures*, vol. ii. p. 346.

86. *Corrosive Sublimate Pills.*

℞. Hydrargyri sublimati corrosivi, ammoniæ hydrochloratis āā gr. j.—ij.; aquæ destillatæ guttam; micæ panis quantum satis est, ut fiant pilulæ xij., quarum sumatur una ter die. *Sir B. Brodie.*

87. *Corrosive Sublimate and Bark for Children.*

℞. Hydrargyri sublimati corrosivi gr. j.; tincturæ cinchonæ (*vel tincturæ rhei*) ℥ij.; solve. Dosis fʒj. ter die ex aqua. *To be taken after meals.* (*Sir A. Cooper.*)

88. *Iodine Mixture.*[*]

℞. Iodinii gr. ½; potassii iodidi gr. j.; aquæ destillatæ f℥vj.

Vel ℞. Tincturæ iodinii compositi (P. L.) ♏xx.; aquæ destillatæ f℥vj.

Vel ℞. Liquoris potassii iodidi compositi (P. L.) f℥ss.; aquæ destillatæ f℥vss. Misce. Sumatur totum indies divisis dosibus.

89. *Iodine Ointment.*

℞. Iodinii gr. vij.; potassii iodidi ℈ij. adipis ℥j. Misce.

Iodine Paint

Is composed of iodine with half its weight of iodide of potassium rubbed together with enough spirits of wine to make it of the consistence of paint. *Used as a strong discutient for bubo, diseased joints, &c.*

90. *Iodine Lotion.*

℞. Liquoris potassii iodidi compositi f℥j.; aquæ destillatæ f℥x. Misce. *For Scrofulous Ulcers, Fistulæ, Ophthalmia, &c.*

91. *Rubefacient Solution of Iodine.*

℞. Iodinii ʒiv.; potassi iodidi ℥j.; aquæ destillatæ f℥vj. Misce. *To touch very indolent sores, the edges of the eyelids, ozœna, &c.*

92. *Caustic Solution of Iodine.*

℞. Iodinii, potassii iodidi, āā ℥j.; aquæ destillatæ f℥ij. Misce. *To destroy weak granulations, ragged edges of sores, &c.*

93. *Iodine Bath*

Should contain, for children, half a grain of iodine to each quart of warm water; and, for adults, one drachm to twenty-five gallons. The body may be immersed ten minutes.[†]

94. *Iodide of Potassium with Bitters.*

℞. Potassii iodidi gr. xij.; extracti gentianæ ℈ij. Misce et divide in pilulas duodecim.

℞. Potassii iodidi ℈j.; infusi gentianæ compositi f℥vss.; tincturæ aurantii f℥ij. Misce. Dosis, pars sexta ter die.

95. *Iodide of Potassium with Alkali.*

℞. Potassii iodidi gr. xij.; potassæ bicarbonatis ʒj.; (*vel* liquoris potassæ f℥ij.;) syrupi f℥ss.; aquæ f℥vss. Misce. Dosis f℥j. bis die.

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[*] These three formulæ are of the same strength. The dose of iodine may be gradually increased to gr. 4-5ths, or gr. i. daily.

[†] Vide Essays on the Effects of Iodine in Scrofulous Diseases, by Lugol, translated by O'Shaughnessy; London, 1831.

96. *Iodide of Potassium with Colchicum.*

℞. Potassii iodidi ℈j.; potassæ bicarbonatis ʒj.; vini colchici fʒiss.; syrupi fʒij.; misturæ camphoræ f℥viiss. Misce. Dosis, pars sexta, ter vel quater die.

97. *Arsenical Mixtures.*

℞. Liquoris arsenici chloridi fʒj.; aquæ destillatæ f℥vj. Dosis, pars sexta ter die, post cibum. *This solution of arsenic was devised by Dr. De Valingen, an eminent physician who lived in Bishopsgate Street, at the beginning of the present century.*

The writer has had ample opportunities of verifying Mr. Hunt's opinion, that it is more safe and efficacious than the Liquor potassæ arsenitis, or Fowler's solution.

℞. Liquoris potassæ arsenitis ♏xx.—xxx.; syrupi fʒiij.; tincturæ cardamomi fʒiij.; aquæ destillatæ f℥vss. Misce. Dosis f℥j. ter die, statim post cibum.*

§ IV. EMETICS.

98. *Relaxing Emetics.*

℞. Antimonii tartarizati gr. iij.; aquæ destillatæ f℥iij. Misce, sumatur cochleare magnum frequenter, donec vomitus supervenerit.

℞. Antimonii tartarizati gr. j.; ipecacuanhæ ℈j. Misce, fiat pulvis.

99. *Warm Emetics.*

℞. Pulveris ipecacuanhæ, ammoniæ sesquicarbonatis āā ℈j.; spiritûs lavandulæ compositi ♏x.; aquæ f℥j. Misce, fiat haustus. Bibat æger postea infusi anthemidis tepidi octarium. *In the incipient stage of Erysipelas, Fever, &c.*

℞. Farinæ sinapeos vulgaris cochleare magnum; salis vulgaris cochleare; aquæ tepidæ octarium. Misce.

100. *Zinc Emetic.*

℞. Zinci sulphatis ℈ij.; aquæ f℥ij. Misce, fiat haustus.

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* Mr. Hunt, who has had probably greater experience in the use of arsenic than any other man living, gives the following rules for its administration. "It should never be given when there is any feverishness; never on an empty stomach; never in increasing doses, the largest dose ever required being ♏ v. of Fowler's solution three times a day. The first effect to be looked for is an itching or smarting of the conjunctiva, and swelling and puffiness of the lower eyelid; upon which the dose should be reduced to three minims. If the conjunctiva continues much inflamed, the dose should be again reduced; but it should be kept in a tender state throughout the course. The arsenical course should be continued for as many months after the disappearance of the skin disease, as it had existed years before." See papers by Mr. Hunt, in Lancet for 1846, and his Treatise on Diseases of the Skin, Lond. 1847.

§ V. Enemata.

101. *Opiate Enema.*

℞. Decocti amyli f℥iv.; tincturæ opii fʒss—ʒj. Misce. (*Pharm. Lond.*)

Opiate Suppository.

℞. Pulveris opii gr. j.—iv.; cetacei (vel sevi, i. e. *tallow*) gr. x.; misce.

102. *Turpentine Enema.*

℞. Olei terebinthinæ f℥j.; vitelli ovi (*vel* mucilaginis acaciæ) quantum satis sit; tere simul et adde, decocti hordei, *vel* decocti avenæ, f℥xix.

103. *Tobacco Enema.*

℞. Tabaci foliorum ʒss.; aquæ octarium dimidium; macera per horæ quartam partem, et cola.

104. *Castor Oil Enema.*

℞. Olei ricini f℥iij.; potassæ carbonatis gr. xv.; saponis ʒj.; aquæ ferventis octarium; tere simul donec bene misceantur.

105. *Purgative Enemata.*

℞. Magnesiæ sulphatis ℥ij.; decocti avenæ octarium. Misce.

℞. Salis vulgaris ℥j.; decocti anthemidis octarium. Misce.

℞. Fellis bovini inspissati ℥ss.; saponis ʒj.; aquæ ferventis octarium. *Good for dissolving scybala.*

℞. Extracti colocynthidis ʒj.; aquæ ferventis octarium.

106. *Enemata for destroying Ascarides.*

℞. Aloes, saponis āā ℈j.; aquæ octarium.

℞. Aloes, saponis, assafœtidæ āā ℈j.; aquæ octarium. Misce.

℞. Infusi quassiæ octarium; ferri sulphatis gr. v. Misce.

N.B. The *dilute citrine ointment* (one part of the ointment to 12 of hard fat) is a capital remedy. A small piece should be put within the sphincter.

§ VI. Gargles.

107. *Detergent Gargle.*

℞. Liquoris calcis chlorinatæ f℥iv.; mellis ℥j.; aquæ destillatæ f℥iij. Misce. *A tablespoonful to be mixed with a glass of warm brandy and water, to be used as a gargle.*

108. *Cooling and Sialagogue Gargles.*

℞. Mellis, confectionis rosæ caninæ āā ʒij.; aceti destillati f℥ss., acidi hydrochlorici ♏xxx.; aquæ rosæ f℥j.; aquæ puræ f℥vj. Misce.

℞. Potassæ nitratis ʒj.; infusi rosæ compositi f℥viij. Misce.

℞. Oxymellis fʒiij.; misturæ camphoræ f℥v. Misce.

℞. Boracis ʒj.; mellis ℥j. aquæ rosæ f℥j.; aquæ f℥vj. Misce.

109. *Astringent Gargles.*

℞. Aluminis ʒj.; acidi sulphurici diluti ♏xx.; tincturæ myrrhæ fʒij.; decocti cinchonæ f℥vj. Misce.

℞. Zinci sulphatis ʒss.; aquæ f℥viij. Misce.

℞. Liquoris chloridi zinci (*Sir W. Burnett's Disinfecting Solution*) fʒss.; aquæ f℥viij. Misce. *An admirable wash for the mouth when the membrane is flabby and the secretion offensive.*

110. *Stimulating Gargles.*

℞. Tincturæ capsici fʒij.; oxymellis f℥ss.; aquæ f℥vijss. Misce.

℞. Tincturæ pyrethri (F. 183) fʒiij.; aquæ ℥viij. Misce.

111. *Tannin Gargle.*

℞. *Tannin* ℈j.; *brandy* f℥ss.; misturæ camphoræ f℥vss. Misce. *For salivation, spongy gums, relaxed throat, &c.*

112. *Corrosive Sublimate Gargle.*

℞. Hydrargyri sublimati corrosivi gr. ij.; acidi hydrochlorici ♏xx.; mellis ℥j.; aquæ destillatæ f℥vij. Misce.

113. *Creosote Gargle.*

℞. Creosoti guttas xx.; mucilaginis f℥ss.; terre et adde, aquæ f℥viij.

Soothing Gargle.

℞. Extracti papaveris, drachmam; boracis, drachmam; aquæ fluiduncias octo. Misce.

Glycerine is a capital soothing application, either alone, or in combination.

§ VII. LOTIONS, INJECTIONS, AND COLLYRIA.

114. *Frigorific Mixture.*

℞. Sodii chloridi, potassæ nitratis, ammoniæ hydrochloratis, partes æquales; aquæ quantum satis sit ad solvendas. *To be put into a bladder.*

115. *Spirit Lotion.*

R. Spiritûs vini rectificati f℥j.; aquæ f℥xv. Misce.

116. *Goulard's Lotion.*

"This is made by putting two teaspoonfuls, or 200 drops of the extract, of Saturn (*Liq. Plumbi Diacetatis*), to a quart of water, and four teaspoonfuls of brandy." From a Treatise on the effects of Lead, &c.; from the French of Mr. Goulard, Surgeon-major to the Royal and Military Hospital of Montpellier, Lond. 1775. Dilute spirit of wine may be substituted for the brandy.

Nitrate of Lead.

R. Plumbi nitratis, drachmam; aquæ destillatæ, octarium. Fiat lotio. *A capital deodorizing lotion for ulcers, cancers, &c.* (Dr. O. Ward.)

117. *Zinc Lotions.*

℞. Zinci sulphatis ʒj.; aquæ octarium. Misce.

Acetate of Zinc Lotion.

℞. Liquoris plumbi diacetatis fʒss.; zinci sulphatis ʒss.; aquæ destillatæ, octarium dimidium.

Acetate of Zinc with Creosote Lotion.

℞. Plumbi acetatis, zinci sulphatis āā ℈ss.: creosoti guttam unam. Tere simul ut fiat pulvis, in aquæ octario dimidio solvendus ut fiat lotio. *The author learned this formula from Mr. Harvey. It may be supplied to patients in the form of powder, and is an excellent astringent, and corrective of fœtor in otorrhœa and other fetid discharges.*

118. *Lotion of Chloride of Ammonium.*

℞. Ammoniæ hydrochloratis ʒss.; acidi acetici diluti, spiritûs rectificati āā f℥ss.; misturæ camphoræ f℥xv. Misce.

119. *Nitric Acid Lotion.*

℞. Rosæ petalorum ℈j.; aquæ ferventis f℥viij.; acidi nitrici diluti fʒijss. Misce, et cola post horam.

120. *Opiate Lotion.*

℞. Pulveris opii ʒss.; aquæ destillatæ ferventis f℥viij.; macera per horas duas, et cola.

121. *Poppy Lotion.*

R. Extracti papaveris ʒij.; aquæ ferventis f℥iv. Misce. *The addition of a drachm of borax, forms a capital lotion for itching eruptions.*

122. *Conium Lotion.*

℞. Extracti conii ʒj.; aquæ destillatæ fʒiij.; tere simul, et macera per horas duas; dein cola.

123. *Belladonna Lotion.*

℞. Extracti belladonnæ ℈j; aquæ f℥iv. Misce, et cola.

124. *Arsenical Lotion.*

℞. Liquoris arsenicalis fʒj.; aquæ destillatæ f℥j. Misce.

125. *Black Wash.*

℞. Calomelanos ʒj.; mucilaginis acaciæ f℥ss.; liquoris calcis fʒvss. Misce.

126. *Yellow Wash.*

℞. Hydrargyri sublimati corrosivi gr. vj.—xij.; liquoris calcis f℥vj. Misce.

127. *Chloride of Zinc Lotion.*

℞. Liquoris zinci chloridi (*Sir W. Burnett's*) fʒss.; aquæ destillatæ f℥viij. Misce.

128. *Iron Lotion.*

℞. Ferri sulphatis gr. viij.; aquæ destillatæ fʒviij. Misce. See *Mr. Vincent's* "Observations."

129. *Alum Lotion.*

℞. Aluminis ʒss.; aquæ destillatæ f℥viij. Misce.

130. *Blue Lotion.*

R. Cupri sulphatis gr. viij.; aquæ f℥viij. Misce.

131. *Tannin Lotion.*

℞. Tannin ʒss.; spiritûs rectificati fʒj.; aquæ destillatæ fʒiv. Misce.

132. *Oakbark and Catechu Lotions.*

℞. Catechu ʒj.; aquæ ferventis f℥viij. Macera per horam et cola.

℞. Corticis quercus ℥ij.; aquæ ferventis octarium; coque ad consumptionem dimidii, et cola.

133. *Borax Lotion.*

℞. Boracis ʒj.; aquæ destillatæ fʒviij. Misce.

134. *Nitrate of Silver Injection for the Urethra.*

℞. Argenti nitratis gr. ij.; aquæ destillatæ fʒviij. Misce. (*Ricord.*)

135. *Sulphate of Zinc Injection.*

℞. Zinci sulphatis gr. viij.; aquæ destillatæ f℥viij. Misce.

136. *Acetate of Zinc Injection.*

℞. Zinci sulphatis gr. v.; liquoris plumbi diacetatis fʒss.; aquæ rosæ f℥iv. Misce, fiat injectio.

137. *Acetate of Copper Injection.*

℞. Cupri sulphatis gr. v.; liquoris plumbi diacetatis fʒss.; aquæ rosæ f℥ix. Misce, fiat injectio.

138. *Ammoniuret of Copper Injection.*

℞. Liquoris cupri ammonio-sulphatis ♏xx.; tincturæ opii fʒss.; aquæ rosæ ℥iv. Misce, fiat lotio.

139. *Sulphate of Zinc with Opium.*

℞. Pulveris opii ℈ss.; aquæ ferventis octarium dimidium; macera per horas duas, dein cola et adde zinci sulphatis ℈ss.

140. *Collyria.*

℞. Zinci sulphatis gr. j.; *vel* aluminis gr. j.; *vel* cupri sulphatis gr. $\frac{1}{2}$; *vel* argenti nitratis gr. j.; *vel* zinci acetatis gr. j.; *vel* liq. plumbi diacetatis ♏v.; aquæ destillatæ f℥j. Misce.

One part of good brandy to six of water makes an admirable collyrium for most cases.

141. *Corrosive Sublimate Collyrium.*

℞. Hydrargyri sublimati corrosivi gr. j.; aquæ destillatæ f℥viij. Misce. (*Mackenzie.*)

142. *Opiate Collyrium.*

℞. Zinci sulphatis gr. xij. (*vel* liquoris plumbi diacetatis fʒss.); liquoris opii sedativi fʒij.; aquæ destillatæ f℥xij. Misce.

143. *Opodeldoch*, vel *Linimentum Saponis.*

℞. Spiritûs vini rectificati libras iv.; saponis mollis libram unam; digere in leni calore donec fiat solutio, cui adde camphoræ uncias duas, olei rosmarini, origani āā semunciam. Misce, agitando.

144. *Stimulating Liniments.*

℞. Liquoris ammoniæ fʒij; linimenti saponis (*vel* linimenti camphoræ compositi) f℥j. Misce, fiat linimentum.

℞. Tincturæ capsici f℥ss.; linimenti saponis f℥ss. Misce.

145. *Pearson's Liniment.*

℞. Olei olivæ f℥jss.; olei terebinthinæ f℥ss.; acidi sulphurici fortissimi fʒjss. Misce gradatim. *A painful irritant.*

146. *Chilblain Liniment.*

℞. Tincturæ cantharidis fʒiij.; linimenti saponis fʒix. Misce, fiat linimentum. *Wardrop.*

147. *Opiate Liniment.*

℞. Tincturæ opii f℥ss.; linimenti saponis f℥j. Misce.

148. *Conium Liniment, or Epithem.*

℞. Extracti conii ʒj.; glycerine ℥ss. Misce. *In neuralgia, and uterine irritation.*

149. *Belladonna Liniment.*

℞. Extracti belladonnæ scrupulum: *glycerine* fluidunciam dimidiam. Misce. *Glycerine is the best vehicle for narcotic liniments, as it does not dry, and so renders absorption by the skin more easy.*

The extracts of opium and aconite may be used in like manner.

Anodyne Camphor Liniment.

℞. Camphoræ ʒj.; spiritûs rectificati, glycerine aa ℥j. *A capital soothing rubefacient for chronic rheumatism and neuralgia.*

150. *Mercurial Liniment.*

℞ Unguenti hydrargyri fortioris; adipis āā ℥iv.; camphoræ ℥j.; spiritûs rectificati fʒj.; liquoris ammoniæ f℥iv. Misce.

151. *Croton Oil Embrocation.*

℞. Olei tiglii guttas xxx.; linimenti saponis f℥j. Misce.

§ VIII. Poultices.

152. *Bran Poultice.*

Make a linen or flannel bag of the size requisite to cover the part affected, and fill it loosely with bran. Pour boiling water on this till it is thoroughly moistened; put it into a coarse towel, and wring it dry; then apply it so soon as it is cool enough.

153. *Bread Poultice.*

"I shall now speak," says Mr. Abernethy, "of the bread and water poultice. The way in which I direct it to be made is the following:—Put half a pint of hot water into a pint basin, add to this as much of the crumb of bread as the water will cover: then place a plate over the basin and let it remain about ten minutes; stir the bread about in the water, or, if necessary, chop it a little with the edge of the knife, and drain off the water by holding the knife on the top of the basin, but do not press the bread, as is usually done; then take it out lightly, and spread it about one-third of an inch thick on some soft linen, and lay it upon the part."

A very admirable soft poultice for parts that are excoriated, or that threaten to slough from pressure, during long illnesses, may be made by mixing equal parts of bread-crumbs and of mutton suet grated very fine, with a little boiling water, and stirring them in a saucepan over the fire till they are well incorporated.

154. *Linseed Meal Poultice.*

The highest authority on poultices was Mr. Abernethy, who seemed to revel in the idea of them. "Scald your basin," he says, "by pouring a little hot water into it, then put a small quantity of finely-ground linseed meal into the basin, pour a little hot water on it, and stir it round briskly until you have well incorporated them; add a little more meal and a little more water, then stir it again. Do not let any lumps remain in the basin, but stir the poultice well, and do not be sparing of your trouble. If properly made, it is so well worked together, that you might throw it up to the ceiling, and it would come down again without falling in pieces; it is, in fact, like a pancake. What you do next, is to take as much of it out of the basin as you may require, lay it on a piece of soft linen, let it be about a quarter of an inch thick, and so wide that it may cover the whole of the inflamed part."

155. *Yeast Poultice.*

℞. Farinæ lb. j.; cerevisiæ fermenti f℥j. Misce, et calorem lenem adhibe donec intumescant. (Pharm. Lond.)

156. *Mustard Poultice.*

℞. Lini seminum, sinapis, singulorum contritorum libram dimidiam; aceti fervefacti, quantum satis sit; ut fiat cataplasmatis crassitudo. Misce. (Pharm. Lond.)

A far better poultice is made by merely mixing flour of mustard with warm (not boiling) water.

157. *Opiate Poultice.*

℞. Micæ panis, et *lotionis opiatæ* suprapræscriptæ (F. 120), singulorum, quantum satis sit.

158. *Conium Poultice.*

℞. Cataplasmatis panis quantum satis sit; extracti conii ʒj. Misce.

159. *Carrot Poultice.*

Boil carrots till they are quite soft, then mash them into a smooth pulp.

§ IX. Ointments.

160. *Scott's Ointment.*

℞. Unguenti hydrargyri fortioris, cerati saponis āā ℥j.; camphoræ pulverizatæ ʒj. Misce.

161. *Tartar Emetic Ointment.*

℞. Antimonii potassio-tartratis ʒj.; adipis ℥j. Misce.

162. *Ointment for Piles.*

℞. Pulveris gallæ ʒj.; liquoris plumbi diacetatis ♏xv.; adipis ℥j. Misce.

℞. Pulveris opii ℈ss.; liquoris plumbi diacetatis guttas x.; adipis ℥ss. Misce.

163. *Creosote Ointment.*

℞. Creosoti guttas viginti; unguenti resinæ, adipis singulorum unciam. Misce.

These, like the old elemi ointment, are good stimulating applications to indolent and sloughing ulcers; but the creosote is a good deodorizer as well. It is good also for piles.

Peruvian Balsam Ointment.

℞. Balsami Peruviani ʒj.; unguenti cetacei ℥j. Misce.

164. *Chalk Ointment.*

℞. Cretæ precipitatæ ℥j.; olei olivæ ʒiij.; adipis ℥ss. Misce. *For burns, excoriations with acrid discharge, &c.*

Bismuth Ointment.

℞. Bismuthi trisnitratis ʒij.; adipis ʒvj. Misce. *A capital ointment for excoriations and irritable sores.*

165. *Magnesia Ointment.*

℞. Magnesiæ carbonatis ʒj; adipis ℥j. Misce.

166. *Anodyne Bark Ointment.*

℞. Extracti *vel* pulveris opii ʒij.; camphoræ ʒj.; pulveris cinchonæ ℥ijss.; adipis *vel* cerati cetacei, ℥v.; spiritûs vini rect. q. s. misce fiat unguentum.—(*Mr. Cole.*)

167. *Veratria Ointment.*

℞. Veratriæ gr. iv.; spiritûs rectificati fʒj.; adipis ʒj. Misce. *In neuralgia. A bit the size of a bean to be rubbed on the painful part.*

168. *Ointments for the Eyelids.*[*]

℞. Unguenti citrini (*hydrargyri nitratis*) ʒss.; adipis f℥ss. Solve leni calore.[†]

℞. Unguenti citrini ʒss.; hydrargyri nitrico-oxydi in pulverem subtilissimum redacti gr. v.; adipis ʒiv. Misce bene.

℞. Liquoris plumbi diacetatis guttas x.; morphiæ acetatis gr. iv.; calomelanos gr. x.; adipis ℥ss. Misce.

169. *Ointment of Nitrate of Silver.*

℞. Argenti nitratis gr. iv.; adipis bene loti ʒss. Misce.

170. *Calomel Ointment.*

℞. Calomelanos ʒij.; adipis ʒvij. Misce. *In chancre, and condylomata, &c.*

171. *Green, or Verdigris Ointment (Pharm. Ed.)*

℞. Cupri acetatis ʒi.; cerati resinæ ℥j. Misce. *For flabby ulcers; warts; indolent eruptions, &c.*

172. *Goulard's, or Compound Lead Cerate.*

℞. Liquoris plumbi diacetatis fʒiij.; ceræ ℥iv.; olei olivæ octarium dimidium; camphoræ ʒss. Melt the wax, and add gradually to it the oil, in which the camphor has been previously dissolved; as they cool, add the liquor plumbi, stirring continually till well mixed.

173. *Red Precipitate Ointment.*

℞. Hydrargyri nitrico-oxydi, optime pulverizati ʒj.; adipis ℥j. Misce.

§ X. Miscellaneous Prescriptions for various Surgical Diseases.

174. *Demulcent Mixtures for Gonorrhœa.*

℞. Pulveris acaciæ ʒij.; sodæ sesquicarbonatis ʒj.; tincturæ opii ♏xx.; aquæ f℥vijss. Misce. Dosis f℥jss. quater die.

℞. Liquoris potassæ fʒij.; liquoris opii sedativi fʒss.; misturæ amygdalæ f℥vj. Misce. Sumantur cochlearia duo quartâ quâque horâ.

---

[*] *Singleton's Golden Ointment* for the eyelids is said to be composed of equal parts of orpiment and lard.

[†] The nitrate of mercury solidifies olive oil, and renders other oils green and rancid, so that it seems better to return to the old formula, and employ lard only, and not oil in the preparation of the *unguentum citrinum*. Mr. Wilde speaks highly of a *brown* ointment of nitrate of mercury, prepared by the Dublin chemists, some of whom use rape oil, others fish oil.

℞. Liquoris potassæ; tincturæ hyoscyami āā fʒij.; aquæ f℥vi. Misce. Sumatur pars quarta ter die.

175. *Copaiba Mixture.*

℞. Copaibæ fʒij.—iv.; mucilaginis acaciæ fʒiv.; spiritûs ætheris nitrici, spiritûs lavandulæ āā fʒij.; olei cinnamomi guttas ii.; aquæ f℥v. Misce. Dosis f℥j. ter die.

176. *Copaiba and Oil of Cubebs.*

℞. Copaibæ fʒiij.; olei cubebæ ♏xx.; liquoris potassæ fʒij.; sp. myristicæ fʒiij.; misturæ camphoræ f℥vij. Misce. Sumantur cochlearia duo magna ter die.

Copaiba and Kino.

R. Copaibæ f℥ss.; pulveris kino ʒj.; mucilaginis acaciæ fʒiij.; spiritûs lavandulæ compositi fʒiij.; aquæ f℥v. Misce. Sumantur cochlearia duo magna ter die.

Copaiba and Catechu.

℞. Copaibæ f℥ss.; tincturæ catechu fʒvj.; olei juniperi guttas duas; mucilaginis fʒiij.: aquæ f℥v. Misce. Sumantur cochlearia duo ter die.

Turpentine and Copaiba.

℞. Olei terebinthinæ fʒij.; copaibæ fʒvj. Misce; sumantur guttæ quadraginata ter die, ex cyatho aquæ.

177. *Copaiba and Magnesia Pills.*

℞. Copaibæ f℥ss.; magnesiæ carbonatis quantum satis sit ut fiat massa in pilulas dividenda.

178. *Cubebs and Soda.*

℞. Pulveris cubebæ ℈ij.; sodæ sesquicarbonatis; potassæ bitartratis āā ℈ss. Misce; fiat pulvis, ter die sumendus.

179. *Cantharides and Zinc.*

℞. Zinci sulphatis gr. xxiv.; pulveris cantharidis gr. vj.; pulveris rhei ʒj.; terebinthinæ Venetiensis quantum satis sit, ut fiant pilulæ viginti quatuor, quarum sumantur duæ ter die.

180. *Cantharides and Steel.*

℞. Tincturæ ferri sesquichloridi, tincturæ cantharidis āā fʒij.; tincturæ capsici fʒj.; syrupi croci fʒij.; aquæ pimentæ f℥vj. Misce; sumantur cochlearia duo ter die.

181. *For Chronic Cystitis.*

℞. Foliorum buchu, et uvæ ursi āā ʒij.; aquæ ferventis f℥vj. Macera per horas duas; dein cola, et adde liquoris potassæ fʒj.; tincturæ cinnamomi, tincturæ hyoscyami āā fʒiij. Misce; sumantur cochlearia duo ter die.

℞. Pareiræ ℥j.; aquæ destillatæ octarium; decoque ad dimidium; dein adde decocti cinchonæ flavæ f℥vj.; tincturæ hyoscyami fʒiij.; sodæ sesquicarbonatis ʒss. Dosis f℥iij. bis die.

℞. Decocti chimaphilæ f℥j.; syrupi zinziberis fʒj.; spiritûs ætheris nitrici fʒj. Misce, fiat haustus bis die sumendus.

182. *Benzoic Acid.*

℞. Acidi benzoici, ammoniæ sesquicarbonatis āā ʒj.; syrupi tolutani fʒij.; aquæ destillatæ f℥vj. Misce. Dosis f℥j. ter die.

℞. Acidi benzoici, extracti papaveris āā ʒss. Misce et divide in pilulas xij.; quarum sumantur duæ ter die.

℞ Acidi benzoici, sacchari albi āā gr. viij. Fiat pulvis, ter die sumendus. *In urinary disorders, chronic bronchitis and cystitis.*

183. *Antiodontalgic Remedies.*

℞. Masticheo ʒj.; spiritûs rectificati (vel *Eau de Cologne*) ℥jss. Solve. *Cotton imbued with this forms a good temporary plug for a carious tooth. The same purpose is answered by a solution of gum copal in æther; or by collodion, or by a solution of gutta percha in chloroform.* See Tomes's Lectures.

Æthereal Tincture of Tannin.

℞. *Tannin* ʒj.; masticheo ʒj.; spiritûs ætheris sulphurici ℥jss. Misce. *For the same purpose.*

Tincture of Pellitory.

℞. Radicis pyrethri concisi ℥ss.; spiritûs rectificati ℥iv. Macera per dies xiv., et cola. *Half a teaspoonful mixed with a wine-glassful of water forms a very agreeable wash in nervous and atonic toothache.*

184. *Eye Snuff.*

℞. Pulveris asari partes tres; pulveris florum lavandulæ partes duas. Misce. *Vel* ℞. Pulveris euphorbii partem unam, pulveris amyli partes septem. Misce.

Mercurial Eye Snuff.

℞. Hydrargyri sub-sulphatis flavi ʒss.; pulveris glycyrrhizæ ʒij. Misce intime.

185. *Schmucker's Resolvent Pills.*

℞. Sagapeni, galbani, saponis āā ʒj.; rhei ʒjss.; antimonii potassio-tartratis gr. xv.; succi glycyrrhizæ ʒj. Misce. Dosis, gr. xv. bis die.

Richter's Pills.

℞. Ammoniaci, assafœtidæ, saponis, valerianæ, arnicæ āā ʒij.; antimonii potassio-tartaris gr. xviij.; syrupi quantum satis est ut fiat massa. Dosis, gr. xx.—xxx. ter die.

186. *Gallic Acid Mixture.*

℞. Acidi gallici ℈ij.; syrupi fʒij.; aquæ destillatæ f℥viij. Misce. Dosis, pars sexta, tertiâ *vel* quartâ quâque horâ. *In passive hæmorrhage.*

187. *Alum Mixtures.*

℞. Aluminis ʒj.; acidi sulphurici diluti fʒjss.; syrupi fʒss.; infusi rosæ f℥vijss. Misce. Dosis, pars sexta quartâ quâque horâ. *In the same.*

R. Aluminis ʒj.; lactis Oj.; corticis limonis ℈j.; coque per quartam partem horæ, et cola. *To be drunk cold, ad libitum.*

188. *Resinous Lotion.*

℞. Tincturæ benzoes compositæ ʒj.; aquæ f℥ij. Misce.

189. *Sir A. Cooper's Prescription for Cancer.*

℞. Ammoniæ sesquicarbonatis gr. v.; sodæ sesquicarbonatis ʒss.; tincturæ calumbæ fʒj.; infusi gentianæ compositi f℥jss. Misce, fiat haustus bis die sumendus.

190. *Arnica Montana.*

℞. Foliorum arnicæ ʒij.; aquæ ferventis Oss.; macera per horam, et cola. Dosis ℥j.

℞. Florum arnicæ ℥jss.; spiritûs rectificati Oj.; macera per dies xiv., et cola; vel

℞. Foliorum arnicæ ℥jss.; spiritûs tenuoris Oj.; macera per dies xiv., et cola. Dose ♏xv.—xxx. *In nervous headache, atonic amaurosis, tinnitus aurium, and as a local application for muscular stiffness after bruises.* See *Wilde's Contributions to Aural Surgery, Dublin,* 1848.

191. *Phosphorus Pills.*

℞. Micæ panis ʒj.; aquæ destillatæ quantum satis sit ut fiat massa idoneæ crassitudinis, dein adde phosphori granum unum. Misceantur bene et divide in pilulas xx. Dosis, una ter vel quater die. *In intense nervous debility.*

192. *For Ulceration of the Bowels, after fever, in Phthisis, &c.*

℞. Cupri sulphatis gr. iij.; pulveris opii gr. jss.; extracti cujus libet q. s., ut fiat massa in pilulas vj. dividenda. Sumat unam quartis horis.

193. *To melt Nitrate of Silver for the purpose of coating a Probe, or Sound.*

"Some powdered lunar caustic, from six to twenty grains, is to be moistened with water in a little porphyry dish, boiled up over a spirit lamp, and constantly stirred with a silver knife till the water have evaporated, and the caustic remain fluid in its water of crystallization alone, which may be ascertained by its thin pap-like appearance, and the formation of the crystallization-film. This paste is now to be spread with the spatula on the slightly-heated groove of the caustic-holder, and, when it has cooled, any projection is to be removed with the spatula, or with pumice-stone. Whilst boiling, the caustic flies about smartly, and therefore it is necessary to put on a glove, so that the hand be not spotted with black."—*South's Chelius.*

194. *To make common Bougies.*

"A piece of fine linen, which has been already used, nine inches long and half an inch to an inch in width, according to the thickness of the bougie to be made, is to be dipped into melted plaster, and when a little cooled, spread flat and even with a spatula; it is then to be rolled together between the fingers, and afterwards between two plates of marble till it is quite firm and smooth. The bougie must be equally thick throughout its whole length to about one inch from its point, from whence it should gradually taper, and terminate in a firm round point. Bougies are also made by dipping cotton-threads in melted wax till they have acquired sufficient size, after which they are rolled between marble plates."—*South's Chelius. This formula may be useful to surgeons on foreign stations.*

195. *Acid Nitrate of Mercury.*

Dissolve one part of mercury in two parts of strong nitric acid, and evaporate to three-fourths.—*Paris Codex.*

196. *Essence of Beef.*

Take a pound of lean beef, free from skin, bone, and fat: chop it up; put it into a large earthen jar with cover; cement the edges with flour paste; tie it up tightly in a cloth; plunge it into a saucepan, and let it boil for two hours; pour off the liquid essence from the coagulated muscle; let it stand till cold; skim off the fat. *In intense debility, hæmorrhage, &c.*

197. *Nitrate and Muriate of Ammonia.*

℞. Ammoniæ muriatis ʒij.; aquæ destillatæ f℥viij. Misce. Sumat partem sextam vel quartam ter die.

℞. Ammoniæ nitratis ʒss.; aquæ f℥vss.; syrupi aurantii f℥iv. Misce. Sumat cochlearia duo ampla ter die. *Dr. Egan. In rheumatism and secondary syphilis.*

198. *Sulphate of Atropia.*

℞. Atropiæ sulphatis gr. ss; aquæ destillatæ f℥j. Misce, fiat solutio. Except in cases of cataract, Mr. Walton uses a weak solution like this. A stronger solution acts more quickly; but the dilatation remains too long; and patients complain that the adjusting power of the sound eye is interfered with.

199. *To make a Metallic Amalgam or Cement, to fill Decayed Teeth.*

Rub together in a mortar some silver, reduced to a fine powder by filing or by precipitation, with a few globules of mercury. When well mixed into a paste, knead it well with the fingers, and squeeze out any superfluous mercury. Then the cavity of the tooth having been properly scraped out and dried, fill it with the amalgam, making the surface of the metal smooth and even with that of the tooth. The patient must be desired not to use the teeth for some hours, till the amalgam has become hard.

200. *Pills of Chian Turpentine.*

This substance may be made into pills each five grains in weight; which may be sent out in a phial of water, to prevent them from sticking together.—(*C. R. Walsh.*) *In cystirrhœa, &c.*

201. *Phosphate of Lime.*

This may be prepared by boiling about four ounces of ivory dust in water for ten minutes. Then the water should be strained off and thrown away, to get rid of impurities. Then more water should be added, in which the dust should be stewed, till the jelly is extracted, and itself is soft enough to crunch between the teeth. Lemon-juice, wine, sugar, or other flavouring ingredients may be added; and the softened ivory dust be eaten with the jelly.

Or, any quantity of ivory dust or bones may be calcined white, and diluted hydrochloric acid be saturated with it. The dissolved earth should be precipitated by ammonia, and washed; and dilute hydrochloric acid be again saturated with it. This dose is from ten to thirty minims, in sugared water. This is prepared under the writer's directions by Mr. Jolley, of Curzon Street, and by Mr. Bullock, of Hanover Street, Hanover Square.

202. *The Eye Douche.*

The application of a continuous stream of cold or tepid water to the eyelids and adjacent parts is a favourite remedy with most oculists in cases of chronic, congestive, or weak diseases of that organ. There are many contrivances which may serve this purpose, such as the elastic syringe which we have recommended in diseases of the ear; and tubes of gutta percha or vulcanized caoutchouc, leading from a small cistern placed at the proper height.

INDEX.

Abdomen, affections of, 495
Abscess, acute, 50
„ alveolar, 464
„ behind sternum, 494
„ of abdominal parietes, 504
„ of the orbit, 413
„ in bone, 222
„ in the brain, 342
„ in the chest, 491
„ chronic, 53
„ secondary, 61
„ diffused, 61
„ iliac, 349
„ in joints, 264
„ in kidney, 583
„ lumbar, 349
„ from phlebitis, 61
„ of prostate, 575
„ psoas, 349
„ psoas, diagnosis of, from hernia, 535
„ near rectum, 519
„ scrofulous, 91
„ in testis, 615
„ urinary, 570
Acids, injuries from, 156
Acupuncture, 677
Adhesion, 44
Air in veins, 651
Albugo, 375
Alkalis, injuries from, 156
Allarton's operation, 610
Alterative medicines, 39, 41
Amaurosis, 405
Amputation for fracture, 233
„ for gangrene, 82
„ for gunshot wounds, 116
„ for diseased joints, 272
„ primary or secondary, 146
Amputations described, 714
Amussat's operation, 510
Anchylosis, 273
Ancyloblepharon, 363
Aneurysm, 310
„ by anastomosis, 318
„ diffused, 306
Aneurysm, dissecting, 363
„ false, 307
„ in bone, 226
„ traumatic, 306
„ varicose, 318
Ankles, weak, 645
Antimony, chloride of, 156
Antrum, diseases of, 443
Anus, artificial, 509
„ „ as a remedy for imperforate anus, 500, 512
„ diseases of, 541
Aquo-capsulitis, 380
Arcus senilis, 379
Areolar tissue (see *Cellular*)
Arsenic, injuries from, 156
„ as a caustic, 77
„ for onychia, 648
Arteries, wounds of, 298
„ inflammation of, 308
„ laceration of, by fracture, 234
„ operations for tying, 686
Arteriotomy, 674
Artery, intercostal, wounds of, 493
„ palmar, wounds of, 303, 700
„ aorta, 700
„ axillary, 693
„ brachial, 695
„ carotid, 687
„ dorsal of the foot, 713
„ femoral, 705
„ glutæal, 704
„ iliac, 700
„ palmar, 700
„ plantar, 714
„ radial, 698
„ tibial, 707
„ ulnar, 699
„ facial, 690
„ innominata, 690
„ peronæal, 711
„ profunda, 302
„ popliteal, 707
„ sciatic, 705
Arthritis, rheumatic, 265
Ascites, 495

Asthenopia, 402
Atresia ani, 541
,, iridis, 383
Atrophy, 17
Atropia, 781

Balanitis, 189
Bandages, 680
,, for ankle, 68
,, four-tailed, 236
,, clavicle, 237
,, many-tailed, 258
,, starched, 230
,, stellate, 237
Bathing, rules for, 89
Bees, sting of, 158
Biceps, tendon, rupture of, 286
Bedsores, 83
Bladder, diseases of, 579
,, puncture of, by rectum, 559
,, ,, by perinæum, 568
,, ,, above pubes, 560
,, wounds of, 565
Blennorrhœa, 182, 573
Blood, buffed and cupped, 28
,, transfusion of, 676
Bloodletting for inflammation, 35
,, operation of, 673
Boils, 206
Bone, atrophy of, 216
,, diseases of, 214
,, venereal diseases of, 199
,, inflammation of, 219
,, tumours of, 225
Bougie, urethra, 562
,, rectum, 553
Bowels, wounds of, 504
,, inflammation of, 505
,, rupture of, by blows, 503
,, obstruction of, 507, 522
Brachial artery, 695
Brain, compression of, 336
,, concussion of, 333
,, inflammation of, 341
,, softening of, 342
,, wounds of, 340
Breast, diseases of, 631
,, extirpation of, 638
Bronchocele, 484
Brow ague, 331
Bruises, 124
Bubo, 195
Bubonocele, 524
Bunion, 646
Burns, 150
Bursæ, affections of, 208
Butcher's saw, 715
,, fracture box, 747

Calculus, lacteal, 632
,, salivary, 463
,, *vide* Stone
Callus, 228
Cancer, 109
,, chimney-sweepers', 621
,, hæmatoid, 113
,, melanotic, 111
,, osteoid, 113
,, epithelial, 105
,, hard, 111
,, soft, 111
,, diagnosis of, 120
,, of breast, 636
,, of bladder, 582
,, of bone, 226
,, of brain, 345
,, of eye, 414
,, of jaw, 445
,, of lip, 435
,, of nose, 442
,, of orbit, 414
,, of penis, 612
,, of scrotum, 621
,, of skin, 206
,, of spine, 352
,, of tongue, 455
,, villous, 114
,, of rectum, 554
,, of pudenda, 630
,, gelatiniform, 112
Cancroid, 105
Cancrum oris, 437
Cannon balls, spent, 132
Carbuncle, 207
Carcinoma, *vide* Cancer.
Caries, articular, 269
,, of bone, 224
,, of temporal bone, 426
,, of vertebræ, 347
Cartilage, ulceration of, 268
Cartilages, loose, in joints, 267
,, ,, in bursæ, 212
,, ,, in tunica vaginalis, 617
Castration, 621
Cataract, 386
,, capsular, 388
,, operation for, 389
,, in infants, 393
,, diagnosis from amaurosis, 406
Catarrhus vesicæ, 581
Catheter, male, 555
,, female, 629
Caustics, 77
Caustic for Cancer, 117
Cautery, actual, 678
,, galvanic, 678
Cellular tissue, suppuration in, 48
,, ,, diffuse inflammation of, 61
,, ,, diseases and tumours of, 203
,, ,, ulcer of, 75
,, ,, around joints, inflammation of, 271
Chalk-stone, 211

Chancre, 156
  „ diagnosis of, 188
Charbon, 75
Cheilo-plastic operations, 438
Cheloid tumours, 205
Chemosis, 371
Chest, wounds and affections of, 142, 490
Chigoe, 161
Chilblains, 156
Chloroform, 656
Chordee, 180
Cholesterine, 496
Choroid, diseases of, 401, 402
Cicatrices from burns, 153
  „ nerves implicated in, 329
  „ irritable, 737
  „ tumours of, 204, 205
Cicatrization, 46
Circumcision, 611
Cirsocele, 619
Clavicle, extirpation of, 226
Clove hitch, 284
Club-foot, 638
Coccyx, neuralgia of, 739
Cœcum, abscess of, 511
Cold, effects of, 154
  „ as an anæsthetic, 669
Collapse, 1
Collodion, 128
Colloid disease, 112
Compression of brain, 336
Concussion of brain, 333
  „ of spine, 353
  „ of retina, 358
Condyloma, 198
Congenital malformation, 15
Congestion, 18
Conjunctiva, diseases of, 368
  „ granular, 371
Contusion, 124
Convulsions, 13
Corectomia, 385
Coredialysis, 385
Coretomia, 385
Cornea, diseases of, 375
  „ conical, 379
Corns, 204
Corroding ulcer, 75, 76
  „ of the face, 437
  „ of the œsophagus, 470
  „ of vulva, 630
Couching, 392
Crystalline lens, diseases of, 387
  „ „ displacement of, 358
Cupping, 675
Cystic disease of testis, 620
  „ of breast, 631
Cysticercus, 163, 381
Cystitis, cistirrhœa, 580
Cysts, 103
  „ on the iris, 381

Deafness, 423, 430
Deformity of chest, 494
  „ of limbs, 638
  „ of spine, 346
Degeneration, fatty, 17
  „ senile, 18
Delirium traumaticum, 3
Derbyshire neck, 484
Diplopia, 405
Dislocations, 280
Dislocation from disease, 268, 270
Dissection wounds, 163
Distichiasis, 361
Dropsy, acute, 42
  „ of abdomen, 495
  „ of antrum, 445
  „ of chest, 491
  „ of pericardium, 492
  „ ovarian, 496
  „ gangrene, from, 83
Drowning, 482
Dura-mater, inflammation of, from otitis, 426
  „ wounds of, 340

Earache, 426
Ear, affections of, 417
Ecchymosis, 125
Echinococcus, 162
Ecraseur, 672
Ecthyma, 197
Ectropion, 362
Eczema mercuriale, 192
Elbow-joint, excision of, 739
Electricity, 679
Elephantiasis, 120
Emphysema, from broken rib, 241, 490
Empyema, 491
Encanthis, 415
Enchondroma, 101, 122
Entropion, 361
Epiphora, 365
Epispadias, 612
Epistaxis, 439
Epithelioma, 105
  „ of bladder, 582
  „ of larynx, 479
  „ of lip, 435
  „ of penis, 612
  „ of scrotum, 621
  „ of tongue, 455
  „ of œsophagus, 470
Epulis, 461
Erethismus mercurialis, 193
Eruptions, venereal, 197
  „ scrofulous, 91
Erysipelas, 55
Esthiomène, 630
Ether, inhalation of, 651
Eustachian tube, 428
Excision of joints, 738
Excoriation, nature of, 61

Exfoliation of bone, 224
Exostosis, 215
  „ of toe, 649
Exudation, 20
Eye, affections of, 355
  „ injuries of, 358
Eyeball, inflammation of, 356
  „ protrusion of, 415
  „ extirpation of, 416
  „ cancer of, 414
  „ melanosis of, 415
  „ rupture of, 358
Eyes, artificial, 416
Eyelids, diseases of, 360
  „ operation for closing, 416
  „ wounds of, 358
Eyebrow, wounds of, 358

Face, affections of, 430
  „ gunshot injuries of, 141
Farcy, 173
Fasciæ, diseases of, 208
Fatty degeneneration, 17
Fever, hectic, 52
  „ symptomatic, 26
  „ traumatic inflammatory, 26
  „ intermittent, 52
Fibrine, 22
Fibro-plastic cells, 23
  „ tumours, 99
Fingers, contracted, 646
  „ webbed, 647
Fistula, 70
  „ in ano, 549
  „ fæcal, 506
  „ lachrymal, 366
  „ in perinæo, 571
  „ recto-vaginal, 628
  „ salivary, 430
  „ vesico-vaginal, 624
Forceps, artery, 672
  „ bull-dog, 672
  „ lion, 447
  „ long-necked, 224
  „ lithotomy, 606
  „ urethra, 573, 574
  „ polypus, 441
  „ tooth, 460
  „ for excision of piles, 547
Fracture, 227
  „ compound, 233
  „ non-union of, 232
  „ of skull, 338
  „ of spine. 353
  „ of hyoid bone. 480
  „ gunshot, 146
Frost-bite, 154
Fumigation, mercurial, 191
Fungus medullaris, hæmatodes, 113

Gall-bladder, wounds of, 505
Galvanic cautery, 678
Galvanism, 679
Galvano-puncture, 680
Ganglion, 211
Gangrene, 78
  „ from arteritis, 309
  „ from cold, 155
  „ from wound of artery, 232
  „ from gun-shot wound, 146
  „ hospital, 73
  „ from œdema, 83
  „ from pressure, 83
  „ senile, 84
  „ white, of skin, 85
Gastronomy, 507, 511
Genitals, male affections of, 611
  „ female, 624
Glanders, 173
Glands, *vide* Lymphatics
Glandular tumours, 102
Glaucoma, 394
Gleet, 184
Glottis, scalds of, 482
  „ foreign bodies in, 473
Glutæal artery, 704
Goître, 485
  „ aërienne. 488
Gonorrhœa. 179
Gonorrhœal rheumatism, 180
Gouge for bone, 224
Gout, 40
Granular cells, 49
Granulation, 46
Gravel, 589
Guinea-worm, 161
Gum-boil, 464
Gums, affections of, 456
  „ lancing, 456
Gun-shot wounds, 132
  „ fracture, 146

Hæmatocele, 619
Hæmaturia, 583, 588
Hæmorrhage, active, 43
  „ passive, 44
  „ from wounds of artery, 298
  „ from wound of vein, 323
  „ from bladder, 588
  „ from kidneys, 583
  „ from urethra, 572
  „ from nose, 439
  „ from rectum, 548
  „ after extracting teeth, 463
  „ secondary, from wound of artery, 304
  „ secondary, from gun-shot wound, 138
  „ intermediary, 138, 304
Hæmorrhagic diathesis, 307
Hæmorrhoids, 543
Hæmothorax,
Hanging, 482
Hare-lip, 433

Hare-lip pins, 129
Head, gun-shot wounds of, 139
,, injuries of, 332
Heart, wounds of, 494
Hectic, 52
Hemicrania, 331
Hemiopia, 405
Hernia, 512
,, bronchalis, 488
,, cerebri, 341
,, congenital, 545
,, corneæ, 379
,, diaphragmatic, 540
,, encysted, 545
,, femoral, 534
,, inguinal, 524
,, irreducible, 515
,, ischiatic, 539
,, obturator, 539
,, omental, 513
,, pudendal, 539
,, perinæal, 539
,, reducible, 513
,, strangulated, 516
,, umbilical, 538
,, vaginal, 539
,, ventral, 538
Herpes, exedens, 75
,, preputialis, 189
Hiccup, 3
Hip-joint, disease, 275
,, dislocation, 290
,, excision of, 278, 742
Hordeolum, 360
Hospital gangrene, 73
Housemaid's knee, 212
Hydatid disease of breast, 633
,, ,, of testicle, 620
Hydatids, 162, 226, 381, 586
Hydrargyria, 193
Hydrarthus, 253
Hydrocele, 617
,, diagnosis from hernia, 527
Hydrophobia, 166
Hydrops pericardii, 492
Hydrorachitis, 351
Hydrophthalmia, 403
Hydrothorax, 491
Hymen, imperforate, 629
Hyperæmia, 18
Hyperinosis, 28
Hypertrophy, 16
Hypochondriasis, 13
Hypospadias, 613
Hysteria, 11
Hysterical neuralgia, 11
,, tetanus, 11

Impotence, 622
Incisions, 650
Inflammation, 25
,, acute, 34
Inflammation, adhesive, 44
,, chronic, 38
,, diffused, 61
,, erysipelatous, 55
,, gouty, 40
,, modified, 40
,, œdematous, 42
,, rheumatic, 40
,, scrofulous, 85
,, theory of, 33
Inhaler, 467
Injections for gonorrhœa, 183
,, of bladder, 582
Innominata, aneurysm of, 690
Inoculation of chancre, 188, 202
Insects, poisons of, 158
Intra-uterine disease, 15
Intussusception of bowels, 507
Iris, prolapse of, 359
,, diseases of, 381
,, excision of, 395
Issues, 677

Jaw, closure of, 453
,, necrosis of, 452
,, lower, tumours of, 451
,, upper, tumours of, 444
Joints, diseases of, 261
,, excision of, 738
,, false, 232
,, wounds of, 279

Keratonyxis, 392
Kidneys, diseases of, 586
,, wounds of, 505
Knee-joint, disease of, 262, 269
,, excision of, 743

Labia pudendi, affections of, 629
Lachrymal apparatus, affections of, 364
Lagophthalmos, 363
Laryngotomy, 478
Larynx, foreign bodies in, 472
,, venereal disease of, 199
Lateritious sediment, 590
Leech-bites, 36
Lepra syphilitica, 197
Leucoma, 376
Leucorrhœa, 182
Ligaments, affections of, 208, 268
Ligature, effects of, 306
Lip, diseases of, 433
Lipoma, 95
Lithectasy, 609
Lithic acid, 589, 593
Litholysis, 597
Lithotomy, 602
Lithotrity, 598
Liver, wounds of, 504
Lung, wounds of, 493
Lupus, 75
Luscitas, 411
Lymph, 22, 44

Lymphatic glands, scrofulous, 91
Lymphatics, affections of, 213

Macula Lutea, 398, 399
Malformation, 15
Malgaigne's hooks, 257
Malignant disease, 95
„ pustule, 75
Marasmus, 92
Maxilla, superior, tumours of, 444
Melanosis, 108
Membrana tympani, 426
Mercury in primary syphilis, 190
„ in secondary syphilis, 200
„ ill effects of, 192
„ bichloride of, 157, 200
„ in inflammation, 37
Mesenteric disease, 92
Mesmerism, 620, 670
Moles, 206
Mollities ossium, 218
Molluscum, 206
Mortification, *vide* Gangrene, 78
Moxa, 679
Mucus, relation of, to pus, 49, 585
Muscæ volitantes, 405
Muscles, affections of, 208
Muscle, gangrenous inflammation of, 75
Musket-balls, course of, 134
Myeloid tumour, 99
Mydriasis, 384
Myocephalon, 378
Myopia, 409
Myosis, 384
Myringitis, 426

Nævus, 318
Nails, ulcers near, 647
Nebula, 375
Neck, affections of, 329
„ scrofulous abscesses in, 91
„ tumours of, 488
Necrosis, 222
Needles, 128, 629
Nephritis, 586
Nerves, affections of, 329
Nervous pain, 19
Neuralgia, 330
„ hysterical, 11, 19
„ of bone, 219
„ of joints, 279
„ of stumps, 737
Neuroma, 330
Nipples, sore, 632
Nodes, 199, 221
Noli me tangere, 75
Noma, 624
Nose, affections of, 439
„ venereal disease of, 199
Nostrils, imperforate, 443

Ochlesis, 55
Œdema, 42
Œdema, glottidis, 478
„ scroti, 621
Œsophagotomy, 471
Œsophagus, affections of, 468
Onychia maligna, 648
Onyx, 377
Operations, 650
Ophthalmoscope, 395
Ophthalmia, 355
„ catarrhal, 369
„ catarrho-rheumatic, 380
„ gonorrhœal 371
„ purulent, 370
„ rheumatic, 379
„ scrofulous, 373
„ tarsi, 360
Optic Disk, 397, 399
Orchitis, 614
Osteo-aneurysm, 226
Osteo-sarcoma, 102
Otalgia, 426
Otitis, 424
Otorrhœa, 419
Ovarian dropsy, 497
Ovariotomy, 497
Oxalic acid diathesis, 590
„ stone, 593
Ozæna, 442

Pain, nervous, 19
Palate, fissure of, 447
Palm of the hand, wounds of, 303
Pannus, 375
Paracentesis abdominis, 495
„ capitis, 344
„ pericardii, 492
„ thoracis, 491
Paraphymosis, 612
Paronychia, 648
Parotid, tumours of, 488
Parulis, 464
Patella, fracture of, 256
Pediculi palpebrarum, 364
Penis, affections of, 611
Pericardium, dropsy of, 492
Perinæum, abscess in, 570
„ laceration of, 628
Perinæal section, 569
Periosteum, inflammation of, 199, 221
Peritoneum, inflammation of, 505
Peronæal artery, 711
Phagedæna, 71
„ sloughing, 72
„ venereal, 187
Phlebitis, 324
Phlebolites, 328
Phlegmasia dolens, 63
Phlegmon, 50
Phosphatic gravel, 590
Phosphorus, disease from, 452
Phymosis, 611
„ with chancre, 194

Piles, 543
Pneumothorax, 490
Poisons of healthy animals, 158
  „ of diseased animals, 166
  „ mineral and vegetable, 156
  „ putrid or septic, 163
Polypus, 441
  „ of larynx, 480
  „ of epiglottis, 480
  „ nasal, 440
  „ of ear, 421
  „ of rectum, 554
Poplitæal artery, 707
Presbyopia, 409
Proctalgia, 542
Profunda artery, 302
Prolapsus ani, 551
  „ „ internal, 552
Prostate, affections of, 574
Prostration, 1
Protrusion of eyeball, 416
Pruritus ani, 554
Psoriasis præputii, 190
  „ syphilitic, 197
Pterygium, 374
Ptosis, 363
Pupil, artificial, 384
Puriform fluid, 49
Pus, 48
  „ absorption of, 52
Pustule, malignant, 75
Pyæmia, 60

Ramollissement, 49
Ranula, 493
Rattlesnake, 159
Reaction, 2
Rectum, affections of, 541
  „ prolapse of, 551
  „ invagination of, 552
Repair, doctrine of, 21
Respiration, artificial, 483
Retention, *see* Urine
Retina, diseases of, 400, 404
Rheumatism, gonorrhœal, 180, 185
  „ of joints, 261, 265
Rhino-plastic operation, 431
Rhinorrhœa, 442
Rickets, 217, 346
Rupia, syphilitic, 197

Salivation, 192
Sarcoma, 104
Sarsaparilla, 90
Scabbing, 131
Scalds, 150
  „ of the glottis, 482
Scalp, wounds, of, 332
Sclerotic, diseases of, 379
Schneiderian membrane, inflammation of, 442
Sciatic artery, 705
Scirrhus, *see* Cancer
Scott's ointment, 264
Scrofula, 85
Scrofulous diseases of bone, 224
  „ „ of eye, 373
  „ „ of joints, 269
  „ „ of lymphatics, 91; 213
  „ „ of skin, 91
  „ „ of testicle, 615
Scrofulous ulcers, 91
Serocystic disease, 104, 634
Serpents, poisons of, 159
Serrefines, 672
Serum, effusion of, 42
Seton, 678
Strabismus, 411
Short sight, 409
Shoulder-joint, excision of, 741
Silver, nitrate of, injuries from, 157
  „ „ discolours the conjunctiva, 377
Sinus, 70
Skin, diseases of, 192, 203
  „ scrofulous disease of, 91
  „ tumours of, 204
Skull, fracture of, 338
Snake-bites, 159
Softening, 49
  „ of brain, 343
  „ of spinal cord, 354
Spectacles, 391, 409
Spermatocele, 619
Spermatorrhœa, 623
Sphacelus, 78
Sphincter ani, division of, 543, 550
Spiders, bite of, 159
Spina bifida, 350
  „ ventosa, 271
Spine, affections of, 346
Spleen, wounds of, 505
Splint (Heath's) for excision of elbow, 740
Splints, 230
Sprains, 209
Squinting, 411
Staphyloma, corneæ, 378
  „ iridis, 378
  „ scleroticæ, 402
Staphyloraphy, 447
Stomach, wounds of, 504
Stomach-pump, 472
Stone, 593
  „ in the kidney, 594
  „ in bladder, 595
  „ in prostate, 578
  „ in urethra, 596
  „ in woman, 619
Stricture of œsophagus, 469
  „ of rectum, 553
  „ of urethra, spasmodic, 555
  „ of urethra, permanent, 560

Struma, 85
Stumps, affections of, 737
Styptics, 303
Subcutaneous injuries, 24, 124
Suppuration, 47
Sutures, 128
Symblepharon, 363
Synchysis, 403
Syncope, 1
Synechia, 383
Synovial membrane, diseases of, 261
Syphilis, primary, 186
,, secondary, 197
,, of children, 202
Syphilophobia, 13

Tabes mesenterica, 92
Talipes, 638
Tarantula, bite of, 159
Tarsus, excision of, 749
Tartar on the teeth, 463
Taxis, 508
Teeth, affections of, 456
Tendons, affections of, 208
Testis, diseases of, 614
Tetanus, 4
,, chronic, 10
,, hysterical, 11
,, infantile, 10
Throat, swabbing, 466
,, venereal sores in, 198
,, wounds of, 483
Thyroid gland, affections of, 484
Tic douloureux, 330
Toes, distortion of, 645
,, exostosis of, 649
Tongue, affections of, 453
,, ulceration of, 455
Tonsils, affections of, 466
Toothache, 458
Torsion, 303
Tourniquet, 714
Tracheotomy, 478
Transfusion of blood, 676
Trephining, 344
Trichiasis, 361
Trismus infantum, 10
Trusses, 514
Tubercle, pathology of, 87
,, mucous, 198
Tuberculosis, 85
Tumours of antrum, 449
,, of gums, 465
,, of bone, 102
,, of bursæ, 211
,, of cellular tissue, 203
,, cartilaginous, 100
,, chalk-stone, 211
,, cheloid, 205
,, of cicatrices, 205
,, colloid, 100
,, of conjunctiva, 375
Tumours, of cranium, 345
,, encysted, 103
,, epithelial, 105
,, in eyelids, 363
,, extirpation of, 672
,, fatty, 95
,, fibro-nucleated, 99
,, fibro-plastic, 98, 123
,, fibrous, 96
,, fibrinous, 100
,, gelatiniform, 100
,, glandular, 102
,, of larynx, 480
,, of neck, 488
,, of pharynx, 470
,, horny, 205
,, of iris, 384
,, of synovial membrane in joints, 267
,, lacteal, 632
,, of lips, 435
,, of lower jaw, 451
,, of upper jaw, 440
,, of lymphatics, 213
,, malignant, 95
,, of male genitals, 620
,, of female genitals, 629
,, of maxilla superior, 440
,, of maxilla inferior, 451
,, myeloid, 99
,, in the side of the neck, 488
,, of nose, 440
,, osteoid, 113
,, of nerves, 329
,, of the orbit, 413
,, osseous, 102
,, on œsophagus, 470
,, of ovary, 497
,, of parotid, 488
,, pathology of, 93
,, painful subcutaneous, 97
,, of rectum, 554
,, of scalp, 345
,, of the skin, 205
,, tarsal, 363
,, of throat, 480
,, of thyroid gland, 486
,, of tendons, 210
,, in urethra, 573
,, vascular, of female urethra, 629
,, of veins, 328
,, general diagnosis of, 120

Ulceration, pathology of, 64
Ulcers, 66
,, from burns, 152
,, cancerous, 121
,, cancerous of skin, 204
,, cancroid, 76, 105, 121
,, corroding, 76
,, of cellular membrane, 75

Ulcers of cornea, 377
,, of eyelids, 360
,, epithelial, 105
,, fistulous, 70
,, healthy, 66
,, indolent, 67
,, inflamed, 66
,, irritable, 66
,, on lips, 435
,, malignant, 121
,, menstrual, 75
,, about the nails, 647
,, of the face, 437
,, of œsophagus, 470
,, phagedænic, 71
,, of rectum, 543
,, semi-malignant, 105
,, sloughing, 71
,, scrofulous, 91
,, serpiginous, 75
,, on tongue, 455
,, varicose, 71
,, venereal, primary, 186
,, weak, 67
Urethra, male affections of, 572
,, contraction of orifice of, 572
,, rupture of, 571
,, discharges from, 179, 573
,, chancre in, 187
,, female affections of, 629
Urinary abscess, 570
Urine, albuminous, 583
,, extravasation of, 571
,, incontinence of, 579
,, retention of, from stricture, 555
,, ,, from diseased prostate, 578
,, ,, from palsy of bladder, 580
,, ,, hysterical, 580
,, sediments in, 583, 589
,, serous, 583
,, suppression of, 588
Uvula, enlargement of, 467

Vaccination, 679
Valgus, 638
Varicocele, 623
Varicose ulcers, 71
Varix, 326
,, aneurysmal,
Varus, 638
Veins, affections of, 323
,, tumours of, 326
Vegetable irritants, 158
Venæsection, 35, 673
Venereal disease, 176
Vertebræ, diseases of, 317
Viper, 159
Vitreous humour, diseases of, 398, 401, 403

Warts, 203
Wasps, sting of, 158
Wens, 205
Whitlow, 648
Wind-contusions, 133
Wounds, contused and lacerated, 127
,, gun-shot, 132
,, incised, 127
,, poisoned, 160
,, punctured, 131
,, of abdomen, 144, 503
,, of arteries, 298
,, of chest, 142, 492
,, of joints, 279
,, of scalp, 332
,, of throat, 483
,, of brain, 140, 340
,, of veins, 323
,, nerves, 329
,, of eyelids, 358
,, subcutaneous, 124
,, tongue, 454
Wry-neck, 489

Xerophthalmia, 364

Zinc, chloride of, 77
,, sulphate of, 117

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